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ABSTRACT

The 17-month (1967-1968) study summarized in this report concerned experimental analysis of the verbal behavior of disadvantaged preschool children (an interracial group of 28, ranging in age from 30 months to 42 months). Research was conducted in the verbal behavior laboratory at the University of Rochester and in a remodeled private home in a low-income area of the city. Teaching strategy consisted of analyzing the behavioral targets, establishing requisite antecedent behavior (RAB) under tightly controlled teaching conditions, integrating these behaviors with other activities in the nursery school, and finally establishing more complex RABs. The chief result of the research is a series of programs and procedures which proved successful in modifying the children's behavior. Included are tables showing results of tests and of management and efficiency measures; discussion of teaching tactics, apparatus, and materials; a program outline; descriptions of games; an appendix; and a list of related publications. (JM)

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OPERANT STUDIES
in the
EXPANSION AND REFINEMENT OF VERBAL BEHAVIOR
in
DISADVANTAGED CHILDREN

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Stanley M. Sapon

January 1969

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Final Report
Contract No. OEO-2401
Office of Economic Opportunity

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Rochester, New York

January 1969

ACKNOWLEDGMENT

I welcome this opportunity to offer warm thanks to those people who gave so much of their energy and imagination to the work described here, and to the report itself. Although it is customary to sort out and specify the nature of each contribution, I find it difficult to precisely identify single individuals with separate creative and supportive activities.

The contributions of my co-workers, which range from painting and carpentry in the pre-school building, constructing special play apparatus, preparing teaching materials, working as creators and administrators of novel procedures, analyzing data, ministering to the children with band-aids, laughter, solace, or dry training pants--as needed--to preparing the manuscript for this report, reflect only a part of the total effort.

Nevertheless, in what is admittedly inadequate fashion, I want to thank H. Dieter Blindert for shouldering a large burden of overall responsibility, and for the incisive way in which he responded to a host of problems. Barbara Wescott, Bruce Sales, Mike Cataldo, Bob Reeback, Tom Schiebel, Les Goldstein shared in all of the activities related to the project, as did Paula Treichler, who added as well her fine editorial skills. To Betty Brandon and Candi Haynes go very special thanks for providing the solution to the problems of all the daily details and logistics of a pre-school centered research project. Grateful appreciation is here offered for conspicuous gallantry in their management of the telephones; the typewriters, and the project director.

PREFACE

The following report summarizes the results of a seventeen-month study related to the verbal behavior of disadvantaged preschool children. The research has been conducted in a variety of settings: in the Verbal Behavior Laboratory of the University of Rochester, in physically conventional preschool quarters, and in a small replica of the experimental space of the Verbal Behavior Laboratory that was located on the second floor of the preschool building.

The children who participated as subjects were enrolled in the preschool, and represent the socioeconomic levels that accord with the children for whom Project Head Start was established. The children ranged in age from two to three and a half years at the beginning of their preschool experience -- a span that includes the typical age for Head Start children, but that also reaches about a year below the age criterion generally applied to the preschool.

While the research described here has been multidirectional, its central thrust has been toward the experimental analysis of the verbal behavior of young children and a concomitant intensity of exploration and experimentation in the modification of the verbal behavior of the subject population. The results of this inquiry contribute to the understanding and identification of those properties of the environment, both physical and social, that affect the acquisition of verbal repertoires. They also yield a set of directions for establishing certain criterion behaviors in children that are necessary for effective participation in subsequent school activities and in general social interactions.

The programmatic nature of the research has led to the exploration of such dimensions as teaching materials, strategies and tactics of teaching procedures, principles of organization: in short, a teaching environment that is effective in bringing children to given levels of performance, and that is replicable in the sense that all relevant details have been specified. As a result of this orientation, the fundamental question posed in the research has not been "Given a defined group of children in a conventional preschool setting, how many children will reach a criterion level of performance?" but rather, "How must we manipulate and control the physical, social, procedural, and tactical environments to bring a defined group of children to a criterion level of performance?"

The general results of the investigation permit us to say that, given an environment with specifiable features, staff with basic training in administering particular teaching procedures and programs, specifiable materials and a given amount of time, a group of intact preschool children whose repertoires of school antecedent behaviors are limited or absent can be brought to a uniform criterion level of performance.

Specifying the requirements of such a teaching environment entails specifying as well what is meant by "level of performance"; objective measurement of verbal behavior is incorporated within the research design.

The results of this research are relevant to several aspects of the preschool education of disadvantaged children: (1) it is of the greatest importance to provide children with the school-antecedent behaviors appropriate to the school systems they are likely to encounter; the research provides procedures for establishing requisite antecedents for teaching, as well as those for learning within the white middle-class school system. (2) Preschool settings are rarely designed to function as efficient teaching environments -- too few teachers and too many children are only two of the problems restricting the application of conventional teaching procedures; the primary problem derives from the belief that children of this age are "not ready" for systematic teaching. The research here presents evidence to the contrary, and provides concrete management procedures for turning any preschool setting into one where teaching systematically and effectively takes place. This includes the organization of teaching situations to maximize efficient use of staff and setting. (3) The teacher in the conventional preschool or primary school faces a class in which children are at unequal levels of performance: one child may already have begun to read while another does not yet sit still and attend to the teacher. The teaching procedures developed in the course of this study assure criterion achievement at every step within a behavior sequence, establishing, for example, "attending behavior" before attempting to establish any other. Although the structure of the preschool described here does not require all children to be at equivalent levels of performance (so that a child who enters school later than the others is at no great disadvantage), it guarantees that they can be. (4) The "curriculum" of this preschool is focused on verbal behaviors, for in this area the "disadvantaged child" is most often distinguished from other children. It is the verbal behavioral repertoires of the child which put him in contact with his environment, and put his teachers in contact with him. No vague and global teaching goals have meaning, no "development of self concept" is teachable, without careful and fine-grained analysis and training in verbal behavior. The research presented here offers at once a set of analysis and training procedures for expanding and refining verbal repertoires, and in this sense too makes the child accessible for all subsequent teaching.

It is toward these areas, then, that the research is directed: education of disadvantaged children toward enrollment in the standard American school system; general preschool management; development of a curriculum that assures criterion performance in a variety of behaviors; development of a curriculum that is specifically directed toward verbal criterion performance.

The report is organized as follows:

I. Rationale; description of theoretical framework; statement of objectives.

II. Description of teaching strategy: underlying principles; application of strategies in educational setting; selecting behavioral targets; Requisite Antecedent Behaviors; acquisition and display of behaviors; summary.

III. Description of teaching tactics: physical facilities, population, teaching staff and other resources; procedures for determining entering (baseline) behaviors; types of teaching occasions; measurement and evaluation.

IV. Results of research: testing; measures of preschool management and teaching efficiency; measures of teaching tactics; description of teaching apparatus and materials.

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RATIONALE[1]

One of the most often stated goals of preschool activity is that of preparing young children for most effective participation in more formal, primary school, environments. Since the notion of what constitutes criterion entering behavior in urban, middle-class primary schools is to a large extent a function of the expectations of teachers, further conditioned by their experience with children from an urban, middle-class population, research in compensatory education needs to be guided by several precautions: (1) One should beware of assuming that the goal of compensatory education be limited to bringing disadvantaged children to equivalent, or identical, entering repertoires that primary school teachers have identified as being prerequisite. (2) Considering that the degree and extent of "academic success" produced by current primary school procedures is characterized by reference to "normal curves" of achievement, there is a possibility that high-powered efforts in compensatory education may be directed toward the preparation of disadvantaged children to function at current levels of expectation that may be of a horse-and-buggy nature.

These observations are a prelude to a discussion of what appears to be a vital notion in preschool education. Many preschool programs, both instructional and diagnostic, revolve around a set of behaviors labeled as "School Antecedent."[2] Now it is obvious that any complex behavioral repertoire depends on the existence of prior, requisite behaviors. In fact, it is largely by a careful analysis of the evolution of complex behaviors that we are able to establish them. The point at issue here is that the setting of a preschool compensatory curriculum that is based on the needs and expectations of current primary school teachers carries a double hazard ... first, the risk that current expectations, tied as they are to what is achievable in traditional settings with presently applied techniques, are much lower than they might be, and second, the danger that the setting of behavioral targets defined by school objectives will mislead efforts in compensatory education by providing our disadvantaged with training that is frequently non-relevant to (or even incompatible with) effective adaptive behavior in the larger world outside of the formal school environment.

In an attempt to avoid prematurely limiting the direction and scope of our investigations, we have set our behavioral goals in broad functional terms. For example, it is generally agreed that socio-economically deprived youngsters appear in school and elsewhere as verbally disadvantaged. From the point of view of *function*, verbal behavior can be looked upon in terms of *control*; that is, "Is the child under the control of the *verbal* behavior of his parents, teachers, peers?" and "Can the child effectively control his social and physical environment through the medium of his own verbal behavior?" It is evident that unless a child's behavior is under some effective control of his teacher's verbal output he is a poor candidate for instruction in a school setting, however informal it may be. And unless a child can control his environment verbally, he will be limited to direct physical manipulation of this environment ... both objects and people, a state of affairs that is clearly incompatible with any directed group activity.

Further pursuit of the notion of function in verbal behavior raises the distinction between functional and formal analyses of children's language. The number of studies of the *formal* properties of children's language is overwhelming, *but* a careful characterization of the formal deviations or aberrations in the language of a group of children tells us nothing about *how* their language behavior works -- or does not work-- *for* them in various environments. While formal descriptions can become prescriptions for a desired terminal behavior, they offer no strategic or tactical directions for effecting the desired change. Formal descriptions that are divorced from functional considerations seriously hamper pedagogical efforts since they lead us to see the child's language as being either at criterion or not -- correct or incorrect. Such binary analyses mask the fine gradations of behavior that are necessary if we are to recognize a multitude of progressive steps toward the criterion behavior.

To give a concrete example, it has been frequently pointed out that one of the consequences of severely restricted early experience is the inability of disadvantaged children to identify colors. From the point of view of purely formal characteristics, a child who pronounces the word "red" so that an adult can recognize the word has demonstrated an acceptable degree of formal adequacy. When we examine "red" as a response, and seek to determine the stimuli that control it, we find several kinds of adequacy. Exploring a few possibilities, we find:

1.) "Red" under control of the stimulus
"Say 'red.'"

2.) "Red" under control of "What color is this?" when the object presented is some other color.

3.) "Red" under control of "What color is this?" when the object presented is red.

4.) "Red" under control of "What color is a tomato?" when no tomato is present.

While condition (1) is obviously hierarchically lower than (4), it nonetheless represents a behavior far from primitive. In the first place, the response is under the control of the formal properties of a sentence that is directive; in the second place, the acoustic properties of the model have served to control the child's articulatory behavior with regard to "red." Condition (2), while not likely to be praised or even scored "correct" as a test item, represents a significantly greater extension of the child's verbal behavior. All the possible controlling stimuli are functioning, with the exception of the spectral properties of the object. That is, functioning elements of the child's verbal repertoire include the discrimination of interrogative pitch contours, the discrimination of relative interrogative features (the child did not respond "Yes" or "No"), and the discrimination of the class of responses appropriate for a question that contains the item "color" (the child did not respond "Monday" or "Susie" or "Two").

Even without fully analyzing the spectrum of controlling stimuli, we find that a vital feature of the analysis begins to appear: the analysis itself suggests a strategy for modifying entering behaviors at any point on the spectrum in the direction of more complex behaviors. Further, it can be seen that we are dealing with a series of rather straightforward tasks: to establish a behavior under limited stimulus control, and gradually increase the complexity of controlling stimuli. When we get to condition (4), we are approaching the kind of behavior involved in the response "red" to the stimulus set of "I have a ball in my pocket. The ball is the same color as a tomato. What color is the ball?" When a child has been brought to this point, we can say that functional control over his verbal behavior is being exercised by his physical environment, past and present, and his verbal experience, past and present.

"Common sense" designs are frequently found in nursery school and kindergartens, based on the notion that a given set of behaviors can be "fostered" or "encouraged to develop" in an environment that is rich in stimulation with regard to those behaviors. Following the precept of the enriched environment, the playroom or classroom is likely to be profusely decorated with many bright colors -- toys, tables, chairs, gaily colored prints and paintings on the walls. In terms of functional relevance (stimulus and response specific consequences) to the children who live and work in the environment, it is clear that some of the items have relevance in terms of their function -- that is, the chairs are sat upon, the tables hold drawing paper and playthings, the toy trucks roll, and the teeter-totter teeters. But, for example, the color of the objects has no relevance to their function, and indeed provides stimuli that are actually irrelevant or inconsequential with this environment. Stimuli that are irrelevant or inconsequential to the "signal," the communication theorist calls "noise." Looking at the properties of an environment from the point of view of a child, this notion is useful. For a newborn baby, the environment he confronts is vastly over-enriched. That is, almost all the sights and sounds that impinge on his receptors are equally irrelevant. There is no "noise" because there is no "signal." As soon as some stimulus properties of the environment acquire relevance, e.g., the sound of mother's voice, or the sight of his bottle, they are discriminated out of a background of "noise." Obviously, what is "noise" to a small child, is a broad spectrum of vital information to an adult. One might, without overly exaggerating, describe the educational process as one in which "yesterday's noise" becomes "today's signal." This universe of discriminative stimuli does not ordinarily expand, however, in any planned, systematic fashion.

A further issue crucial to the experimental design is that of control over the consequences of the child's behavior. The answer to the question of why a child should "work at learning" is not approached through the concept of "motivation" -- which seeks some property in the child to explain his perseverance (or lack of it) in a learning task -- but rather through a consideration of the kinds of consequences that follow upon the emission of a specific bit of behavior. Fine grain analysis and experimentation with supportive consequences -- their identification and the exploration of appropriate schedules for administering them -- is vital to the success of attempts to modify a response or its stimulus control.

A final element that forms part of the rationale is the application of a principle that has been empirically proved. The principle states that "The environment in which a repertoire is appropriately displayed is not necessarily the most appropriate environment for the acquisition of those behaviors that are requisite antecedents to that repertoire."[3]

The work described in the following pages grows out of this kind of analytical approach. Its ultimate aim is to develop an environment in which children may be led to exhibit increasingly complex behavioral repertoires, based on the assumptions that different teaching settings are appropriate for the acquisition and generalization of different types of behavior, and that the interaction between the teaching setting and the teaching goal must be a crucial focus for research. The results of this investigation in terms of teaching strategy are described later in some detail (III). In general, the rationale is based on the following sequence: small bits of behavior are acquired in individual teaching sessions where a great deal of control is exercised over stimuli and over consequences; once the behavior is established at high strength, it is introduced into individual teaching sessions under more loosely controlled conditions, into group teaching activities, and into activities which approximate "real world" conditions in terms of their loose stimulus and consequence control. In this way, a behavioral repertoire is built up in a changing environment in which the child's responses are at all times functional.

THEORETICAL FRAMEWORK

The research has been conducted within a general framework characteristic of the experimental analysis of behavior. Within this framework, language is viewed as a special repertoire of operant behaviors, and the research strategies developed and employed are drawn from the field of the experimental analysis of verbal behavior. The essence of the experimental analysis of behavior is that it permits a view of behavioral events in terms of three discrete elements. These elements, in what Skinner[4] has called a "three-term contingency model" are the control stimulus, the response, and the consequences to the organism of that response. Although every behavioral event involves all three terms, it is the middle term, the response, that is likely to be the most visible to an observer, and hence the term most likely to be described. Similarly, efforts at behavior modification, or teaching, are equally likely to be directed at the response. Yet a response is emitted under the control of some stimulus and inevitably provides some consequence to the organism; this relationship provides a basis for predicting or controlling the response by manipulating and controlling the first and third elements of the event. A concise way of stating this relationship is to say that the emission of a response in the presence of some stimuli is followed by some consequence to the organism. The consequence may be such that it increases (or decreases) the probability that this response will again be emitted in the presence of the same (or similar) stimuli.

We are again indebted to Skinner[5] for the term "operant behavior" which he coined to describe those behaviors through which an organism acts, or operates, on his environment. A vital part of the control stimulus and all of the consequence are properties, not of the organism, but of the environment. That is to say, nearly two-thirds of the behavioral event are found to be controlled by the environment -- the physical environment provides both the control stimulus for the response and the consequences of that response.

Several points should be underscored at this juncture: 1) the physical environment represents a major portion of the behavioral events we are concerned with, 2) every organism acquires a repertoire of behaviors through which he operates on his physical environment, and 3) through these repertoires an organism operates directly on his physical environment.

The research reported here has necessarily involved the physical environment, but the central concern has been with verbal behavior. A brief word of explanation is perhaps necessary for the consistent use of this term in places where the terms "communication" and "language" might be expected. There are several important reasons for this insistence. First, it escapes the common tendency to see "language" as what people say as discrete from what people do. Maintaining such a distinction denies "language" the status of behavior and the consequent applicability of a body of scientific methodology. Second, the global view imposed by the term "language" obscures the differences in behavior displayed by a human being as a speaker and as a listener/understander. In normal, full-grown adults the discreteness of these behaviors is rarely apparent, but in young children the differences are striking, and of crucial relevance to problems of intervention in "language development." Finally, concern with "language" has centered around an interest in the form and structure of people's utterances -- form and structure that are considered subject to analysis independent of the environment in which they were emitted. This kind of language analysis represents an abstraction of the middle term of the three-term behavioral event, the response, and leaves unexamined the environmentally supplied control stimuli and consequences, thereby making it impossible to perceive and analyze the function of an utterance.

When we talk of verbal behavior, we are still concerned with human beings acting, or operating, on their environments, and their behavior is still viewed in terms of control stimuli, responses and consequences. But human verbal behavior does not act directly on the physical environment. It operates rather on a social environment composed of other human beings. Further, it does not act on human beings merely as physiological organisms, but only on those human beings who possess functioning repertoires of verbal behavior themselves.

If a man wishes to open a door and turns the doorknob himself, he acts directly on his physical environment with the consequence that the door opens. If his arms are full of packages and he says to a passerby, "Would you please open the door for me?", the consequence is likely to be the same -- but a different sort of event has taken place. He has indeed ultimately acted upon the physical environment, but he has done so indirectly, through the agency of another human being. He has operated not upon the physical environment, but upon the verbal repertoire of another human being. If that passerby did not speak English -- that is, did not possess a functioning repertoire of verbal behavior coincident with the speaker, the same consequences would not have taken place. A verbal event involves the verbal behavior of *two* people: the productive repertoire of a speaker, and the receptive repertoire of a listener/understander. This is another way of demonstrating two primary functions of a verbal repertoire, that is, the *productive* emission of verbal behavior that *controls* the behavior of another human being, and a repertoire of *receptive* verbal behavior that permits one to be *controlled* by the verbal behavior of another person. The successful conclusion of the described event would not have been damaged in any way if the speaker had a hearing loss that would have prevented him from responding to someone else's request, or if the passerby had a severe case of laryngitis. All that is necessary at this moment is that the speaker's productive repertoire and the listener's receptive repertoire be functioning.

The environment provides both control stimuli and consequences for behaviors in the physical realm; but this statement must be expanded when we apply it to verbal behavior. Control stimuli and consequences are still supplied by the physical environment, but an additional source of control stimuli and consequences is functioning -- the verbal behavior of the social environment, both productive and receptive. The presence of other human beings whose behavior is under verbal control is a control stimulus for the emission of verbal behaviors; the predictability of the listener's behavior under verbal control is an essential element of the consequences that support the speaker's behavior. In designing an environment for the development of verbal behavior, a procedure is required for the systematic organization and structure of both the physical *and* the social envionments in which these behaviors are to be developed. For a long time, the ability to structure the physical environment has been available, but the equivalent ability to plan, organize, and structure a social environment does not fall so easily within the "state of the art."

A classroom can be organized to determine with some certainty what a child will see, and what objects will be available for his tactile and manipulatory contacts, but it has been much more difficult -- indeed, considered impossible by some -- to present a "standard" verbal environment. It is easier to predict and control what a room looks like and what is in it than to predict or control exactly what a teacher will say, and how she will respond to what a child says.

Consider again the acquisition of "color concepts" -- a sub-set of verbal repertoires that are not only considered as useful and important in a child's daily life, but are also likely to be assessed in determining his I.Q. The ambiguities of the term can be resolved in simple fashion by identifying the problem as measurement of two verbal repertoires, one receptive, the other productive. The receptive repertoire would be called upon by the display of a number of sheets of variously colored paper and the direction that the child "Point to the yellow one." A correct response would be one that is under the stimulus control both of the verbal directions and the spectral properties of the paper. The child need not speak, but the movement of his finger is determined by a coordinate response to the word "yellow" and the corresponding wavelength reflected by the paper. The productive repertoire would be called for under the controls of a sheet of colored paper and the question "What color is this?" The response in this case too is under the control of a verbal stimulus and the spectral properties of an object, but here the response is vocal rather than digital. It is extremely important to recognize that two distinct classes of responses can be made under the general rubric of "color," and the existence of a receptive repertoire does not guarantee the appearance of a productive repertoire. Thus the behaviors displayed by a child who "knows his colors" represent the intersection of controls and consequences supplied by both the physical environment and the verbal social environment, although the behavior is measured in terms that are exclusively verbal.

These are the major theoretical considerations on which the research design is founded. They may be summarized to include a fundamental distinction between receptive and productive verbal repertoires, the analysis of a verbal event as a three-term contingency involving discriminative stimuli, response, and response consequences, and the manipulation of controls over stimuli and consequences both in the physical and the social environments.

This framework prescribes a number of features for an environment in which these considerations may be investigated. The physical facilities and other resources of the research design are described in the following section.

OBJECTIVES

The goals of the present research have been identified and discussed throughout the preceding sections, but in the interest of completeness the objectives are restated here in concise form:

1. To investigate the verbal behavior of young children, in functional terms, to identify environmental and behavioral factors that contribute to its establishment, maintenance, and modification.
2. To develop procedures, programs, and materials to shape and establish specific behaviors appropriate for effective participation in formal, primary school activities -- including the teaching of these requisite behaviors and their maintenance in a variety of settings.
3. To identify those behavior antecedent to, and requisite for, the acquisition of new behaviors in any kind of teaching situation (in or out of school); to develop these behaviors which themselves render a child "teachable."
4. To investigate the possibilities of heightening the effectiveness of parents and other family members as teachers of young children.
5. To find objective measures and identify meaningful units of verbal behavior in terms of formal and functional elements, and in terms of receptive and productive language -- with which to score, measure, identify, and describe verbal behaviors, and to clearly specify behavioral targets for "language improvement."
6. To bring verbal behavior under the control of discriminative stimuli; to bring a variety of motor behaviors under verbal stimulus control; to shape the topography of vocal responses in terms of articulatory movements, sentence structure and stimulus specificity; to generalize verbal behavior to a variety of physical and social settings.

TEACHING STRATEGY

The principles underlying teaching strategy are derived from the field of the experimental analysis of behavior, and are most clearly stated in the form of Skinner's "three-term contingency model."[6] This calls for viewing a behavioral event as a sequence of control stimulus (S^D), response, and the consequences of that response to the organism. Results from the laboratory, with both human and infra-human species, clearly demonstrate that control over the second term of the contingency--the organism's responses--can be achieved through manipulation of the first and third terms of the model. In a teaching situation, this means that control over stimuli and consequences makes it possible to directly shape, increase, and refine the repertoire of a child.

To apply these principles effectively in an educational setting, special strategies are required to bridge the distance between the "ideal," highly controlled conditions of the laboratory and the "real world" conditions that children grow up in. Specifically, this means strategies by which (1) behaviors acquired in the school setting will be functional for the child outside the school; (2) behaviors acquired under tight stimulus and consequence control will come gradually to be maintained under natural conditions--a wide and variable range of stimuli, and for natural, or social, consequences; (3) the school setting is arranged so that teaching opportunities and staff efficiency are maximized, through educational procedures which are realistically applicable to other school settings; (4) the physical environment is arranged so that each teaching occasion is maximally effective--i.e., the environment is optimally suited to the nature of the teaching occasion.

The strategies for achieving these aims were based on careful analysis of the three terms of the contingency model. A major starting point of this analysis was the recognition that a child's verbal repertoire may be clearly separated into receptive behaviors and productive behaviors. Very roughly, this is a distinction between his "understanding" (acting under the control of) the verbal output of other people, and his "expressing" things verbally which other people understand. Abundant evidence supports the thesis that these two repertoires are acquired separately, under different kinds of stimulus control, and continue to maintain a somewhat separate function.[7] This had important implications in direct, tactical terms, and influenced the design of procedures for establishing receptive and productive behaviors separately, the design of a physical setting, and the nature of the behaviors to be established.

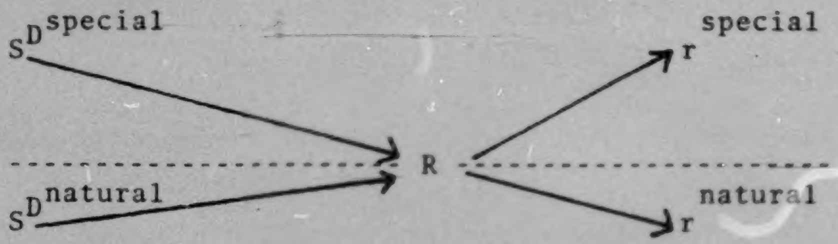
Specifically, one criterion for selecting a response to be taught was that it be extendable in function from a receptive repertoire to a productive one. A behavior of naming colors (or color-tacting, in Skinner's terminology), for instance, is extendable in this way: it can be established first in the receptive repertoire under a verbal control such as "Point to the green card," and extended to form a productive response under a verbal control like "What color is this?" and a visual presentation of a green card.

Analyzing the behaviors pre-requisite to a child's effective functioning in a standard school system led to additional criteria for selecting responses: (1) behaviors pre-requisite to any teaching ("school-appropriate behaviors") were considered of prime importance--these included attending to the teacher, sitting still, emitting model-imitative responses, etc.; (2) behaviors functional in multiple settings such as color-tacting, counting and social behaviors were given priority in teaching over behaviors clearly less applicable in many everyday situations; (3) responses which were easily extendable to other responses were selected over non-productive ones (for example, the paradigm response "I wanna___" is rapidly extendable to "I wanna play," "I wanna jump," etc., and the paradigm "___ box" is rapidly extendable in the nursery school to "slide box," "twinkle box," and at home to "bread box," "toy box," etc.; (4) since the topography of the response is considered to be a major problem for Negro children in white school systems, a way of testing articulatory difficulties was considered pre-requisite to teaching, as well as a way of measuring effectiveness in teaching in this respect. It was also decided that responses would be taught as they are most commonly spoken--not over-articulated into forms like "I want to go," but rather "I wanna go."

Building complex behaviors (such as any of the behavioral goals considered desirable and appropriate for nursery school children) requires their reduction to simpler behaviors which are antecedent to and requisite for their emission. By establishing Requisite Antecedent Behaviors (RAB's) in a carefully programmed sequence of "bits" of behavior, a child can be brought to display a full, complex repertoire. Teaching strategies designed to rapidly and reliably establish such behaviors are based upon a further principle of behavioral science: the environment in which a repertoire is appropriately displayed is not necessarily the most appropriate environment in which its Requisite Antecedent Behaviors are acquired. "Bits" of behavior are best established when tight control can be exercised over all three terms of the behavioral event. Achieving this kind of control requires that a number of general conditions be fulfilled: (1) that no behavior be introduced for teaching until its Requisite Antecedent Behavior "bits" (these were termed RAB-bits) have been established at a criterion level of performance; (2) that, accordingly, reliable records and evaluations be made of all teaching occasions; (3) that behavioral targets be clearly specified in non-impressionistic terms. Additional, more specific conditions are furnished by laboratory work with young children, and demonstrate that the speed and ease of establishing novel responses are closely related to (1) the standardization of control stimuli in the physical environment; (2) standardization of verbal stimuli in the social interraction between child and teachers; and (3) control over the consequences to the child of making discriminative responses to these stimuli. In terms of strategy, these three points suggest that RAB-bits should be established in a standard and unchanging setting; that the visual properties of teaching materials should conform to a general standard design; that verbal control stimuli should be presented in the same words and sequence, both by one teacher on different occasions, and by different teachers; that reinforcement (consequences) should be provided on a strict schedule following the child's performance; and finally, that reinforcement should have a reliable relation to strengthening the behavior being established.

This last point required theoretical exploration of the specific properties of reinforcing consequences. Because a major aim of the research was the generalization and maintenance of verbal behaviors outside the school setting, it was important to find reinforcing consequences generally available. The repertoire of responses which the child acquires in the tightly controlled, special setting just described are supported by consequences also unique and special to that setting. The generalization of this repertoire demands that the same inventory of responses be emitted under loose stimulus control and for consequences either social (such as verbal commendation--"good"--from a parent) or derived from engaging in the behavior itself (as reading a book or looking at pictures may be called "self-reinforcing" when it leads to further book-reading).

The strategy for bringing established responses to function under more natural stimuli and consequences in the special setting may be described schematically as follows:



I. Behaviors are established in a "special" setting, with highly standard stimulus controls and special, unique consequences with known and demonstrable reinforcing properties. The special consequences are accompanied by verbal reinforcement from the teacher.

II. Still in the special setting, responses remain under tight stimulus control but special reinforcing events are spaced over longer intervals (that is, the schedule of reinforcement is changed), with greater reliance on social-verbal reinforcers.

III. The response is brought under the control of natural stimuli within the special setting, by the teacher's presentation of "ordinary" questions, comments, etc. with consequences including verbal praise, and the reinforcing properties of the exchange per se.

This description of strategy represents a kind of "micro-analysis" of the manipulation of contingencies within the controlled, individual teaching session. A much broader strategy was designed for bringing behaviors established in the special setting to function under multiple controls in other kinds of teaching activities. This broader process is loosely termed "Convergence strategy," and provides for the continual integration of newly-established behaviors with a variety of group activities (defined for the moment as those involving one or more teachers and more than one child). The acquisition of a complex repertoire gradually takes place as the child masters one behavior in the special setting and subsequently has the opportunity for displaying it in the group setting--often for very "real" consequences such as entering the lunch room upon emission of the established response. In this way, responses acquired under special circumstances acquire functional value in other settings.

Each "bit" of behavior established in isolation is integrated into the complex repertoires already functional in other teaching settings. This convergence of novel responses with established behaviors guarantees, in essence, that terminal behavioral repertoires will be reliably established in each child, and will be functional across a wide range of activities, settings, and contingencies.

The overall teaching strategy for bringing children with initial verbal deficiencies to criterion performance in a number of complex verbal behaviors may be broadly summarized as the following sequence: (1) selection of behavior to be established, and breakdown into its Requisite Antecedent Behaviors (RABs); (2) baseline testing of children for these RABs; (3) individual teaching sessions in tightly controlled setting to establish RABs; (4) group or individual activities which draw upon established repertoires, and bring the newly-established RABs under the control of less structured stimuli and consequences; (5) establishment of additional, more sophisticated RABs for more complex behaviors; (6) repeat cycle.

TEACHING TACTICS

The task of turning principles of strategy into functioning teaching tactics involved the design of an appropriate physical setting; development of teaching programs, activities and equipment; development of procedures for measurement and evaluation; and training of staff members to administer teaching programs, operate equipment and carry out testing, scoring and evaluation on a daily basis. The following section outlines the application of strategy to the design of research and teaching activities in the nursery school setting.

Physical Facilities

The research was conducted in its initial stages at the Verbal Behavior Laboratory at the University of Rochester, and subsequently in a three-story remodeled private dwelling in a low income area of the city. The preschool, operated in this building, was called the Child Language Development Center (CLDC).

The first floor included a large playroom, a dining room and a kitchen (See Fig. 1). The playroom, 15 x 25 feet, was illuminated by windows on three sides and by a room-length bank of fluorescent lights on the ceiling. Built-in shelves were used to store blocks, dolls, and other toys, and the room was stocked with conventional play equipment. The dining room, somewhat smaller, was equipped with child-size tables and chairs and easels for drawing and painting. Four rooms were used on the second floor (See Fig. 2). One, approximately 9 x 13 feet, was used as an interview and testing room for work with parents and children. A second room, approximately 12 x 15 feet, was initially used for storage and subsequently as a space for the reinforcement devices. A third room, approximately 12 x 15 feet, served as a general purpose work room, additionally equipped with videotape monitors for observation of all teaching areas. The fourth room was divided by a partition containing a plate-glass viewing area and treated to provide some measure of acoustic isolation; this room provided a carefully controlled experimental space for work with one child at a time. The video camera and videotape recording apparatus were located within the partitioned area, which permitted adequate viewing space for two or three observers. From behind the glass partition photographs could be taken of children and teacher. The room was wired for microphone pickup fully adequate for even low level responses from the children in all parts of the room. The working space, an area of about 6 x 10 feet, had a carpeted floor and was furnished with a child-size table and two chairs. On the table was a device which dispensed tokens in the form of 3/4" metal washers when the teacher depressed a foot switch under the table (See Fig. 3). At the other end of the room, behind the child's chair, were a number of reinforcement devices operated by token-deposit. All devices had the common characteristic of providing timed self-terminating periods of audio-visual presentations found to function as supportive consequences for the children. These devices, with the exception of the token dispenser, were not in this room for approximately the last three months of research, but were moved across a hallway to a second room, described above. For the greater part of the period, however, the room typically contained the Twinkle Box, which offered a three-second display of alternately flashing green and red star patterns on an 8 x 8 inch screen, accompanied by relay clicks; the Movie Box, which projected an animated cartoon on a 4 x 6 inch screen for an eight-second interval; and the Slide Box, which projected a sequence of 35 mm. color slides on a 4 x 4 inch screen. Additional reinforcement devices used for special programs included the Matching Box and the Mystery Matching Box. The third floor contained one large air-conditioned room which was used for staff meetings.

Population

Subjects were drawn from the population characterized as socially disadvantaged, roughly the families from whom the children of Project Headstart are taken. Announcements were distributed to the principals of four elementary schools in a low-income area, and distributed through them to children in kindergarten and first grade to take home to their parents. Additional copies were posted around the neighborhood. Parents were invited to visit the CLDC for an open-house, accompanied by their children. At this time, parents were interviewed in the testing room, and children were invited to interact with the nursery school staff in the playroom.

From the file of parent interviews, children were selected according to the following criteria: (1) socio-economic qualification as disadvantaged (based on size of family, street address of home and occupation of either or both of parents); (2) age within desired range, thirty through forty-two months of age; (3) distribution of boys and girls, to arrive at an equal balance; and (4) racial distribution--no attempt was made to fix specific proportions, but at least to assure an interracial group. Twenty-eight children generally meeting these criteria served as subjects for the three sessions combined. Their productive verbal behavior ranged from near total silence to fairly intelligible speech; receptive behavior ranged from extremely limited to adequate. Detailed information on entering behaviors of subjects is provided in a later section.

Calendar

The first group of ten children attended an eight-week pilot session from May 1 to June 22 of 1967. Over the summer, the data and impressions provided by this session were analyzed, and resulting modifications of apparatus and procedures made. On September 18 of 1967, a second eight-week session opened with a new group of eight children, and ran through October 26. The full term session, which opened on November 13, 1967 and ran through May 9, 1968, incorporated the modifications and refinements of the two earlier sessions. One child was a "graduate" of the first session, and three children were continued from the second session. The rest of the children were new, providing a total of ten subjects.

The Center was open Monday through Thursday of every week, from 10 a.m. to about 12:30 in the afternoon. The full-term session had a total of eighty-seven school days.

The first two weeks of the full session were devoted to the testing required to obtain baseline behavioral measures. The structured teaching program began in the third week of school, and the final week was spent in post-testing.

Staff

The permanent staff included the principal investigator, a core of graduate students, and a laboratory assistant experienced in the management and teaching of very young children. A pediatrician was enlisted for testing and for medical check-ups. An arrangement was made with a local high school to provide students from a home economics class, girls who represented the same population as the children. They helped prepare menus and meals, serve, and clean up.

A total of ten students served as teachers during the period of research, with five or six typically present each day. Their experience and training with young children ranged from zero to very little, and they ranged academically from high school graduates to Ph.D. candidates.

Because an important aim of research was to develop procedures directly applicable to standard school settings, teachers were limited to a number probably available to a nursery school class. For the greater part of each day, two or three teachers worked directly with the children. The other staff members (two or three) were assigned to research functions, unique to this particular school setting only. Thus the total of six staff members for the ten children does not represent the teacher-pupil ratio.

All staff members rotated among teaching and research functions on a weekly basis, which provided a further means for extending the efficiency and practicality of management procedures. Teaching functions included interacting with children during group structured activities, free play, individual teaching in the playroom and dining room, and individual teaching in the controlled experimental area upstairs. Research functions included timing and scoring the above activities, operating the recording equipment in the upstairs room, etc. Activities at the beginning and end of each day--receiving children, handing out smocks, serving and supervising lunch, dispatching children at the end of the day--were assigned to different staff members each week.

A section in the Appendix illustrates the distribution of duties and typical weekly scheduling.

Determination of Baselines

Entering behaviors were measured and evaluated in several ways. Three standard tests for young children were administered to all subjects during the first week of the final session (November 1967 - May 1968). These tests included the Goodenough-Harris Drawing test (Draw a Man), the Peabody Picture Vocabulary test, and the Denver Developmental Screening test (administered by a pediatrician). A further test, whose development was pursued in the course of this research, served as a measure of the child's entering "intelligibility." The refinement of this test is considered an important outcome of research, and requires description in some detail. It is the result of a pressing need for meaningful and useful evaluation of child speech--both for diagnosis and for providing baselines of entering behavior and measures of behavioral change. Based on the observation that a child's ability to verbally control his social environment can be described in terms of his "intelligibility" to other human beings, a model of progressive growth has been conceived in the following terms. In the beginning of speech, a child may be "understood" (a) only by his mother, (b) only when she and child share the same environment. For example, a mother may "understand" that a child is asking for a cookie when they are both in the presence of the cookie jar, but fail to "understand" him when he emits the same utterance in the living room. With reference to the same person, i.e., the mother, verbal growth may be seen as the extension of intelligibility to communication which is less dependent on shared environmental cues. In parallel fashion, another measure of growth can be seen in the extension of intelligibility to other human beings who do not have intimate or extensive contact with the child. This would imply an expansion of the number and kind of people with whom the child can successfully communicate. At first, the child is understandable to his mother and close family members only when they share the same environmental stimuli; later he is understood by his intimates without dependence on environmental cues; later he may be understood by strangers when the child and the stranger share a specific environment; still later he will be understood by any normal human being independent of environmental cues. In sum, this implies that a child's communicative function can be seen to increase in terms of two widening circles of persons and places until he becomes what we consider a "normal" functioning member of the verbal community.

In accord with the above analysis, a test instrument was designed and developed to yield both qualitative and quantitative measures of a child's "understandability." This instrument, labelled the Sapon Intelligibility Function Test, or SIFT, is administered as follows: the child is shown a series of forty large, drawn pictures and asked to name the objects portrayed (See Fig. 4). An audiotape recording of his responses is then played back to one of his parents, to parents of other children, and to non-parents. For the first twenty items, the judge must identify what he thinks the child said on the basis of acoustic properties alone. For each of the second twenty items, the judge is shown four pictures as he hears each response, one of which is the picture the child saw. He is asked to indicate the picture he thinks the child saw and what he thinks the child actually said.

In initial experimentation, the SIFT was scored on the basis of the number of correct identifications to yield two percentage scores indicating the intelligibility of the child's speech with and without a shared environment.

Subsequent refinement in scoring provided measures of judges' responses according to whether they are on-target, off-target, and/or off-target agreements. Thus for Part I, judgment of the child's responses on the basis of acoustic properties alone, responses are scored as follows:

Target:	correct identification of what child saw (scored somewhat broadly, so that "dog," "puppy" or "bow-wow" are all acceptable for "dog")
Off-target:	a response which clearly does not correlate with what the child saw (e.g., for "fish" anything from "dog" to an unintelligible response)
Off-target agreements:	judges agree on what the child said but this bears no relation to the stimulus picture (e.g., if the child saw a fish and four judges thought he said "dog")

"I don't know":	If the child has responded "I don't know," this is clearly neither target nor off-target. "I don't know" responses are deducted from the total number of items, and the score adjusted accordingly.

This analysis of judges' responses permits finer discriminations of the child's intelligibility under varying conditions of judgment, and allows an estimation of the child's articulatory precision beyond the simple basis of his ability to communicate specific information.

In addition, very specific information about the child's articulatory deficiencies is provided. When a child responds "Iron" to a picture of an iron, and several judges believe he has said "arm," training targets are made clear by this discrepancy.

Baseline behaviors were determined for specific target behaviors such as color tacting, number tacting, name reading, drawing, and social behaviors (saying "How are you," and "Fine," "Please," and "Thank you").

In addition to formal testing, baseline measures of social behaviors were obtained by observing the child during play activity. Whenever possible, teachers noted down children's behavior with regard to--for instance--ease of separation from Mother, incidence of crying, going to the bathroom, hitting other children, digital obstructive behaviors, and so forth. The teachers' notes were compiled in a daily log, providing a rough record of entering social behaviors by a procedure more satisfactory than wholly impressionistic, ex post facto, evaluations.

Videotape recordings were made of all individual teaching sessions in the upstairs workroom. This provided feedback for teachers, making their performance available for review and criticism by other staff members. Each child's sessions were recorded in sequence on one reel of tape (rather than recording all sessions for one day on one reel). The chronological changes in the behavior of each child could thus be watched from Session No. 1 through his most recent session without changing tapes.

For the final full-length session, children's daily activities were encoded and stored on McBee cards. Activities themselves were first recorded on score sheets (described in III) and on daily report forms filled out by each staff member; this information was condensed and transfered to the coded McBee cards.

Teaching Tactics

Overall teaching strategy was described earlier as progression from an analysis of behavioral targets to baseline testing of children, establishing RAB's under tightly-controlled teaching conditions, integrating these behaviors with other activities in the nursery school, and finally establishing more complex RAB's. In tactical terms, this can be illustrated by a detailed example.

Analysis of behavioral targets. A complex behavior was selected for teaching on the basis of the criteria outlined in Part II--usefulness in home and school, extendability in function, etc. An example of such a behavior is receptive color-tacting. This requires the child to emit appropriate non-vocal responses (pointing) under verbal controls such as "Point to the *blue* card," for a series of colors (blue, green, red, *yellow*, black, white, pink, orange and purple). *Baselines* were then obtained by asking each child to receptively tact these colors, keeping records of the number of criterion responses.

Establishing RAB's. The RAB's for receptive color tacting include attending to the teacher, and emitting other behaviors appropriate for teaching; emitting imitative behaviors under the control of a verbal or visual model; pointing; attending to the visual properties of objects and discriminating among them; and attending to the auditory properties of the names of objects, and making appropriate discriminations.

This set of RAB's was established with a sequence of "programs," each program based on its particular requisite antecedent "bits." The total sequence brought each child to criterion performance in receptive color tacting. In one of the program sequences which were used, these sessions were broken down as follows:

1. Adaptation to RABbit Room. Entering the room, taking a seat, attending to the teacher, and emitting imitative responses under model control; being taught to store tokens and deposit them in reinforcement devices. (Fig. 5 and 6)

2. Receptive tacting: Pointing appropriately under the verbal control of "Point to the ___." This behavior is established with photographs of teachers,

with whom the child is already familiar by name. Thus the pointing response is emitted under the specific verbal controls of "Point to the picture of Mike," "Point to the picture of Barbara," etc. (Fig. 7).

3. Matching to sample. Presented with an array of pictures, the child is asked to "Point to the picture of Mike"; "Now, point to the one that matches." In this way the child is taught to attend closely to the visual properties of the pictures. (Fig. 8)

4. Matching to sample is extended to numbers, where the child again must attend to physical properties and make fine discriminations. This behavior is established under the control of "Point to the four (five, two); now point to the number that matches." (Fig. 9 and 10)

5. Matching to sample is extended to colors. Again the child must make discriminations among visual properties of objects. The verbal control is "Point to the green card" (accompanied by teacher's pointing), "Now point to the one that matches." (Fig. 11 and 12)

6. Matching to absent sample. One set of color cards is on the table, a matching set in a box across the room. The verbal control is "Point to the green one; now go over to the box and bring me the one that matches." The child is required to match colors in the absence of a visual guide. (Fig. 13 and 14)

7. Receptive tacting of colors. The child must now attend to the auditory properties of the stimulus, where he must point appropriately under a purely verbal control of "Point to the green one" (red one, etc.). (Fig. 15 and 16)

Each of these steps made up from one to three teaching sessions in the controlled experimental room on the second floor. Teaching sessions in the RABbit Room, so called because RAB-bits were established there, averaged about ten minutes per child. The program of activity in the RABbit Room began on the first teaching day of school (after baselines were obtained). The first set of RAB's, outlined under (1) above, were established as follows:

1. The child, accompanied by his teacher, is led into the room.

2. The teacher inserts a token into one of the reinforcement devices and teacher and child watch the display.

3. The child is given a token to insert in the device.

4. Attention is called to the other devices in the room, and the child is given a token to operate each one of them.

5. While the child is still watching the display, the teacher goes to the table and sits down in a chair, leaving vacant the chair that positions the child with his back to the reinforcement devices.

6. When the display ends, and the child turns to receive another token from the teacher, he is invited to come to the table for another token.

7. When the child comes to the table he is given a token.

8. After he has used the token in the device of his choice, he is invited to sit down at the table and get another token.

9. As soon as the child sits down the teacher operates the token dispenser, and the child returns to the devices at the other end of the room.

Continuing in this fashion, the child will walk to the table, sit down, and attend to the teacher for some ten to fifteen times in the initial session which lasts between eight and ten minutes. At the conclusion of the session the child is told that he will be invited back to the RABbit Room again, and taken back to the general play area.

On the second day, longer periods of sitting at the table are shaped, verbal control stimuli for engaging in the program ("It's time to sit at the table.") are paired with the already functioning environmental visual stimuli, verbal contingencies for reinforcement are added ("Do you want another token?"--any sign of assent is acceptable at this point), and verbal praise is paired with the administering of tokens.

It will be worthwhile at this point to look at this description in terms of the strategies outlined in Part

II. First of all, the child's discrimination of his chair is facilitated by the fact that it is the only unoccupied chair in the room. Second, disruptive or distracting stimuli provided by the sight and sound of the other children are absent. Third, the contingencies for reinforcement have been gradually shifted so that he has been emitting only reinforced behavior during his brief visits to the RABbit Room. Fourth, he has emitted the desired behavior some twenty to thirty times in two school days. This is significant not only because the strength of a behavior relates to the number of times it is emitted and reinforced, but also because it contrasts with the ordinary school situation where several weeks' attendance would be required to bring the behavior in question to the same degree of strength. Fifth, verbal elements of stimulus control and reinforcement have been introduced. Sixth, the RABbit Room has become a "fun place." Since this is the setting in which the most concentrated and intensive teaching will take place, establishing the general reinforcing properties of this small "classroom" is important, not only because this supports the work done there, but also because it becomes possible to make a visit to the RABbit Room contingent on the emission of other behaviors in the downstairs playroom.

By the end of the first four days a repertoire has been established in every child consisting of (1) entering the room under control of teacher's verbal instructions, (2) finding seat, (3) sitting down, (4) hands engaged in non-disruptive activity, (5) attending to teacher, and (6) responding appropriately to "Good morning." The process labeled earlier as convergence strategy governed moving this set of RABs into the natural setting with the introduction into the early morning routine of an activity called Table Time I (See Fig. 17). When all the children arrived, they assembled in the foyer outside the dining room. In the dining room was a long table, of child's height, with a chair for each child in attendance, and a teacher sitting at the head of the table. Each child was then called by name, entered the room, sat down on a chair, put his hands on the table, and exchanged greetings with the teacher. When all the children were seated around the table, the next activity (such as talking about the toys they want to use in the playroom) was begun. When this routine was reliably established, behavior (2) became the focus of interest. In Table Time I the verbal instructions "Go in and sit down." controlled entering the room, selecting an empty chair and sitting down, but there was no specific control for determining *which* seat was selected. The selection of this behavior for expansion provided a new set of natural consequences for the control and support of useful behaviors.

The behaviors involved in identifying one's own photograph touch on a wide spectrum of implications for social behavior as well as for a repertoire of responses under the control of pictorial stimuli. Receptive "tacting" of pictures depends on a repertoire of selecting, or pointing, under the dual stimulus control of pictorial and verbal stimuli, i.e., "Point to the picture of x." in which "Point to the picture..." is a verbal control stimulus for the initiation of pointing, and the discrimination of "x" from an array of other pictures is a visual control stimulus. Taking this as a set of directions for establishing these behaviors as RABs, RABbit Room Program II was designed to establish discrimination of photographs of all the children and the staff members in the Child Language Development Center, and to display this discrimination under the verbal control of "Point to the picture of ____."

When these RABs have been established and brought to some strength in all the children, that is, when every child can identify his own picture when presented with an array of photographs, Table Time is modified (Table Time II) so that the long table has a photo of a different child at each seating position. Verbal controls progress from "Go in and find your picture." → "Go in, find your picture and sit down at your picture." → "Go in and sit down at your picture." → "Go in and sit down at your place." The child thus enters the room, walks around the table scanning the photos, finds his photograph and sits down in front of it. Table Time then continues as before. (Fig. 18)

It has become apparent that the task of finding one's seat by searching for appropriate cues is a reinforcing event in and of itself, requiring no extrinsic reinforcement to maintain it. Evidence from this and other similar experiences supports the conclusion that *whenever a previously irrelevant set of stimulus properties acquires discriminative function, the act of coming under the control of these stimuli becomes a high probability, i.e., reinforcing, event.* The phenomenon is popularly recognized as the "fun" in engaging in a newly established skill, or in looking at objects to "practice" newly learned discriminations. The man who has just learned about the tiny mint marks on coins spends more time looking at coins than he ever did before, and children who have learned to discriminate fine details in one set of pictures are more likely to attend to pictures in general.

Figure 19 outlines convergence strategy, and specifies the tactics that were developed for establishing a receptive repertoire of ten colors, and bringing the repertoire to full functioning strength under natural controls. The terminal behavior is specified in terms of the controls: "Point to ...," "Find ...," etc., object (already in child's repertoire) of specific "color." e.g., "Sit on the green bench." Verbal S^Ds are: red, blue, green, yellow, orange, pink, purple, brown, black and white.

The boxes on the left identify the RABbit Room Program and the behavior to be established. Each Program has as RABs the behaviors established in all the preceding RABbit Room Programs. The boxes on the right identify Programs that are carried out in the Playroom or the Dining Room.

As with the RABbit Room Programs, the last Program depends on the behaviors brought to strength in preceding Programs. For instance, a shift occurs in critical verbal and visual control stimuli for the beginning of Table Time III, IV, and V. Still focused on "finding one's seat," the arrangement was modified so that the children were no longer sitting on their usual folding chairs. Instead, there were ten wooden benches, approximately cubical, each painted with one of the ten colors listed earlier. A set of color plaques, consisting of 4 x 5 in. pieces of Masonite, were painted with the same colors used on the benches. For Program III, each child is given a color plaque at the doorway, and told to "Sit down on the bench that matches this color." The child takes the plaque with him to find his bench. For Program IV, the child is shown the plaque and told to "Sit on the bench that matches this color." He looks at the plaque before he enters the room, but does not take the plaque with him. For Program V no plaques are used and the child is told to "Sit on the green, red, yellow, etc., bench."

Contingency Management

Contingency management is effective teaching procedure for a nursery school setting, for it not only maximizes teaching time, but also aids in the general management of a nursery school day. The fundamental principle of contingency management is to arrange the child's environment so that he must emit a given performance before he is permitted to engage in a reinforcing activity (i.e. demonstrated to be reinforcing for him).

Contingency management was used at the CLDC (1) to extend responses acquired in other settings to function under a wider range of stimulus control; (2) to refine the topography of responses already at high strength; (3) to increase the probability of desirable and appropriate social behavior; and (4) to set up contingencies for all activities, thus increasing teaching time by reducing the time spent in "non-teaching" activities.

To strengthen a response already acquired, the teacher made the contingencies explicit to the child by making a contract with him: "If you say 'green' I'll swing you." More frequently, teachers administered differential reinforcement to shape and maintain a repertoire.

The applications of contingency management techniques are best illustrated pictorially; several examples are shown in the pictures included in the . Result section.

Individual Teaching

In addition to the daily structured group activities of Table Time and Telephone Time, many behaviors were strengthened in individual teaching situations where one or more teachers worked with one or more children. The nature of these sessions was defined primarily by their locale--i.e., they did not take place in the RABbit Room, nor in the dining room during programmed group activities. Many activities not "programmed" for the RABbit Room were introduced in individual teaching occasions: putting puzzles together, naming parts of the body, building houses with blocks, drawing pictures, etc. Some activities initially introduced in individual teaching sessions were later programmed and trained formally in the RABbit Room. In addition, behaviors acquired in the RABbit Room such as color tacting and matching to sample were strengthened and maintained by being extended to other settings and other stimulus conditions outside the RABbit Room.

Pictures in the Result section show children and teachers in individual teaching sessions.

Measurement and Evaluation of Verbal Behavior

Traditionally, the principal means of representing change has been through demonstrating change in frequency or rate. This is notably inappropriate with regard to verbal behavior wherein acceptability is ordinarily determined by the qualitative properties of a response or those in relation to a particular S^D. In the present research a procedure was developed whereby a number of aspects of verbal behavior could be measured quantitatively. These measures were not based on rate, but on the level of approximation to criterion response in relation to the number of S^Ds. The procedure was first used in individual teaching situations to quantify and record children's daily progress. The scoring system was arranged according to classes of responses--receptive tact, productive tact, productive mand, imitative, manipulative. Score for each response was based roughly on the number of steps necessary before the child produces a criterion response. A sample scoring sheet, filled out, is attached in the Appendix along with fuller details on scoring and a graphic presentation of data At the end of each session percentage of criterion responses out of the total for each class was calculated and recorded on the score sheet. The system was extended to describe motor and verbal behavior in the downstairs playroom during group activities (sample and further description included in Appendix).

RESULTS

Results of the research are outlined in the following section. As stated earlier, the nature of the research was chiefly programmatic; accordingly, the chief result of research is a series of programs and procedures which proved successful in modifying the behaviors of the subjects. These programs are described in Part II of this section: specific, structured programs and activities for training and maintaining novel behavioral repertoires, and general tactics which proved useful in a number of ways to nursery school management.

The tables in Part I on the following pages present graphically a summary of test scores on four tests for the subjects of the final, full term session (November, 1967 - May, 1968); a summary of teaching time; breakdown of types of teaching (teaching strategy) and breakdown of teaching time in relation to attendance (teaching economy).

These tables summarize the time spent in formal teaching. The programs and activities described [illegible] Part II summarize the content of teaching. The b[illegible]ioral objective for each program is specified in the description. The inclusion of a program in this report indicates that the behavioral objective was reached by each child at a criterion level of performance. In other words, the program ensures that a child with the requisite antecedent behaviors will perform at a specific level. Thus no formal "testing" of programs took place; the child's baseline (as recorded on videotape and/or by observers) with respect to a given behavioral objective took the place of a pre-test; his completion of the program, given its specified objective of establishing a set of behaviors, constituted a post-test.

PART I TABLES

Testing

Three conventional children's tests were administered to the subjects of the final and full-term session of the CLDC: the Peabody Picture Vocabulary Test (PPVT), the Goodenough-Harris Drawing Test, and the Denver Developmental Scales (this last was administered by a pediatrician, the other two by staff members according to instructions in the test manuals). Pre-testing took place during the first two weeks of the CLDC session in November, 1967 for those subjects who attended from the first day. For subjects admitted later, testing took place during their first two weeks of attendance. All subjects were post-tested during the last two weeks of the CLDC session, which ended May, 1968. For most subjects, therefore, about six months elapsed between testings. Comparative scores are shown on the following pages.

In addition to these three standard instruments, the Sapon Intelligibility Function Test (SIFT) was administered to all subjects and parents as well. Comparative scores are shown.

Goodenough-Harris Drawing Test

(formerly Goodenough Draw-a-Man Test)

The following scores represent percentile ranks calculated from the average of standard scores on the Draw-a-Man and Draw-a-Woman tests. The Goodenough-Harris is not considered reliable for children under four years of age, so all children at the CLDC (who were under four during pre-testing) were scored on a three-year-old scale at both testing periods. It may be noted that most children initially tested in the lower 25% of the national norms. This was considered to be of negligible significance, because as noted above, the test is not considered reliable for children under four, and was not validated on children of the CLDC population ("disadvantaged"). What does seem fairly significant is the increase in scores between testings, where an average of more than 100% increase took place. Specific training in "drawing a man" and "drawing a woman" was not given at the CLDC. The children received specific training in imitative line drawing, drawing a house, a face, a cat, and in drawing in missing parts of a stylized child's wagon.

Table I

Percentile ranks on Goodenough-Harris Drawing Test for all children enrolled at beginning of CLDC Session (November, 1967) and children enrolled at end (May, 1968).

PRE-SESSION		POST-SESSION	
SUBJECT	% RANK	SUBJECT	% RANK
Arnold	9	Arnold	72
Bill	2	Bill	5
John	44	John	61
Kathy	49	Kathy	39
Liva	0	Liva	13
Ronny	3	------	--
------	--	Sean	2
Veronica	0	------	--
Vincent	2	------	--
Yvonne	3	Yvonne	31
$\bar{X}$	12.4	$\bar{X}$	31.9

Table II

Pre- and post-session scores for children enrolled throughout CLDC session, showing comparative percentile ranks of performance in November, 1967 and May, 1968.

SUBJECT	PRE-SESSION % R	POST-SESSION % R
Arnold	9	72
Bill	2	5
John	44	61
Kathy	49	39
Liva	0	13
Yvonne	3	31
$\bar{X}$	17.7	37.

Peabody Picture Vocabulary Test

The Peabody Picture Vocabulary Test (PPVT) yields three measures of performance, expressed as Mental Age, Intelligence Quotient, and Percentile Norms.

Table I presents pre-session and post-session scores for all children attending at those times.

Table II presents the comparative scores for those subjects who were enrolled for the entire CLDC session. Inspection of this table shows that on the average all the children increased in Mental Age by one year and two months; increased in I.Q. by 12 I.Q. points; and increased in national percentile norms by 24.2 per cent.

Table I

Pre- and post-session scores on Peabody Picture Vocabulary Test for children beginning and children ending CLDC session.

Pre-session Scores

SUBJECT	MENTAL AGE	I.Q.	%-ILE
Arnold	3-6	101	51
Bill	2-6	101	58
John	2-7	79	5
Kathy	3-11	108	65
Liva	2-3	89	23
(Ronny)	2-0	80	4
Veronica	2-3	76	4
(Vincent)	2-1	82	4
Yvonne	2-0	69	-
$\bar{X}$	2-7	87.2	23.7

Post-session Scores

SUBJECT	MENTAL AGE	I.Q.	%-ILE
Arnold	3-2	83	12
Bill	3-6	109	69
John	5-5	114	88
Kathy	4-6	105	65
Liva	3-0	101	50
(Sean)	2-4	71	1
Yvonne	3-9	106	63
$\bar{X}$	3-8	98.4	49.7

Table II

Results from Peabody Picture Vocabulary Test for children who started and completed CLDC session.

SUBJECT	MENTAL AGE		I.Q.		%-ILE	
	Pre	Post	Pre	Post	Pre	Post
Arnold	3-6	3-2	101	83	51	12
Bill	2-6	3-6	101	109	58	69
John	2-7	5-5	79	114	5	88
Kathy	3-11	4-6	108	105	65	65
Liva	2-3	3-0	89	101	23	50
Yvonne	2-0	3-9	69	106	00	63
$\overline{X}$	2-9	3-11	91.2	103	33.66	57.8

SIFT

(Description of the aims and procedures of the SIFT may be found on pages 22 to 24, in Section III). Target responses demonstrate the child's functional verbal control over the behavior of others, under varying environmental conditions. Off-target scores are an indication of the specificity and refinement of the child's phonetic productions (articulatory topography) apart from their functional accuracy. That is, an increase in target agreement under Part I indicates that the child's vocal control has increased in the absence of shared environmental cues; if target responses remain the same, but off-target agreements increase, the child's articulation has acquired control over the judges' responses--they agree about _what he said_, even if they don't correctly identify _what he saw_.

The theoretical basis for the SIFT would lead to a prediction that, for one thing, the pre-SIFT scores would show great disparity between Mother's judgments and those of other judges. The post-SIFT scores, assuming a period of training in the interval as at the CLDC, would be predicted to show both an increase in all judges' scores, and closer scores for mothers and non-mothers. In other words, before training begins, one expects the child's mother to "understand" him better than other people; but training should lead theoretically to the child's "increased ability to communicate" to strangers as well as his mother.

Two sets of scores may be discussed for comparison. Arnold's scores on target judgments are low both before and after CLDC training, indicating that his verbal behavior remained idiosyncratic. The increase in off-target agreements, however, indicates that although judges could not identify what he saw, they could indeed identify what he said. The phonetic properties of his responses improved a great deal. On the pre-SIFT, neither Arnold's mother nor the other judges scored his responses very accurately. The post-SIFT judgments under condition I (absence of shared environmental cues) did not increase significantly; but target judgments under all other conditions for both mother and other judges increased a great deal.

Bill's scores suggest a different interpretation. Pre-SIFT target scores were low for judges and for Mother. From a pre-SIFT score of 30% for Mother and 13% for other judges--his verbal behavior improved to yield post-SIFT scores of 68% and 54% respectively, in the absence of shared cues, and to 100% and 96% respectively when environmental cues were shared.

Key to SIFT Tables on following pages:

Part I is the judgment of the child's responses on the basis of acoustic properties alone; responses are scored as follows:

Target:	correct identification of what child saw (scored somewhat broadly, so that "dog," "puppy" or "bow-wow" are all acceptable for "dog")
Off-target:	a response which clearly does not correlate with what the child saw (e.g., for "fish" anything from "dog" to an unintelligible response)
Off-target agreements:	judges agree on what the child said but this bears no relation to the stimulus picture (e.g., if the child saw a fish and four judges thought he said "dog")
"I don't know":	if the child has responded "I don't know," this is clearly neither target nor off-target. "I don't know" responses are deducted from the total number of items, and the score is adjusted accordingly.

In Part II Judge is shown four pictures, one of which the child saw. With this shared environmental cue, Judge must pick out the picture of the four that he thinks the child's response identifies.

In Part III, he is asked to write down what he thinks the child actually *said*.

Table I

Pre-SIFT Scores, in per cents, showing comparative judgments by child's mother and by other judges under three judgment conditions. Month and year of testing is indicated under each child's name.

Judges other than Mother	Arnold 9/67	Bill 11/67	John 9/67	Kathy 9/67	Liva 9/67	Yvonne 11/67	Sean 4/68
PART I:							
Target	30	13	47	67	40	30	51
Off-Targ. Agree.	66	52	63	35	77	59	81
PART II:							
Target	58	77	93	78	86	85	88
Off-Targ. Agree.	62	36	50	59	45	22	22
PART III:							
Target	78	72	75	72	53	65	45
Off-Targ. Agree.	71	47	80	83	66	78	71
Mother's judgments							
PART I:							
Target	40	30	50	83	40	45	40
PART II:							
Target	60	85	95	95	80	85	74
PART III:							
Target	67	65	85	80	55	65	84

Table II

Post-SIFT Scores, in per cents, showing comparative judgments by child's mother and by other judges under three judgment conditions. All testing took place during May and June, 1968.

Judges other than Mother	Arnold	Bill	John	Kathy	Liva	Yvonne	Sean
PART I:							
Target	33	54	62	72	77	68	73
Off-Targ. Agree.	67	48	43	18	43	42	61
PART II:							
Target	91	96	93	98	90	93	86
Off-Targ. Agree.	18	--	50	--	33	--	63
PART III:							
Target	83	87	85	93	85	63	80
Off-Targ. Agree.	60	67	78	75	56	59	57
Mother's judgments							
PART I:							
Target	44	68	65	80	55	75	79
PART II:							
Target	100	100	100	100	80	95	70
PART III:							
Target	89	95	85	95	80	65	70

Table III

Comparative Pre- and Post-SIFT target agreements for all children, showing both Mother's and Non-mother's judgments.

Judges other than Mother

	Arnold		Bill		John		Kathy		Liva		Yvonne		Sean	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
PART I:														
Target	30	33	13	54	47	62	67	72	40	77	30	68	51	73
Off-Targ. Agree.	66	67	52	48	63	43	35	18	77	43	59	42	81	61
PART II:														
Target	58	91	77	96	93	93	78	98	86	90	85	93	88	86
Off-Targ. Agree.	62	18	36	--	50	50	59	--	45	33	22	--	22	63
PART III:														
Target	78	83	72	87	75	85	72	93	53	85	65	63	45	80
Off-Targ. Agree.	71	60	47	67	80	78	83	75	66	56	78	59	71	57

Mother's judgments

	Arnold		Bill		John		Kathy		Liva		Yvonne		Sean	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
PART I:														
Target	40	44	30	68	50	65	83	80	40	55	45	75	40	79
PART II:														
Target	60	100	85	100	95	100	95	100	80	80	85	95	74	70
PART III:														
Target	67	89	65	95	85	85	80	95	55	80	65	65	84	70

Management and Efficiency Measures

Introduction to Tables

In the following tables, as in Part II, a number of terms are used to indicate types of teaching situations and distribution. These terms are defined here with their abbreviations to prevent confusion in interpretation.

CLDC	Child Language Development Center
Teaching Occasion (T.O.)	Period during which child interacted with E, either individually or in a group, in a structured and standardized procedure. It thus does not include any of the Contingency Play in the downstairs play area.
Group T.O.	Structured teaching occasions in which several Ss participated, and where the same behavior was required from each S.
Table time (T)	Any of several Table Time Programs: group teaching occasion.
Telephone time (P)	Any of several Telephone Time programs: group teaching occasion.
Individual T.O. (Indiv.)	Structured teaching occasions, either in RABbit Room or in other area, in which one S interacted with one E.
RABbit Room T.O. (R)	Teaching occasions in RABbit Room, following strict programs with stringent control over stimuli and consequences.

Individual T.O. (I)	Individual teaching occasions not in RABbit room, where one S interacted with one E under more loosely controlled stimulus and consequence conditions.
N of days present	The number of days which an S attended the CLDC.
N of possible CLDC days	The number of days on which an S could have attended (days on which CLDC was open), from the date of his enrollment to the date of his withdrawal or the close of the session.
Hours present	The number of days present multiplied by the number of hours per day, 10 a.m. to 12:30 p.m. (2 1/2 hours per day, or 150 minutes).
Available teaching time	Time present minus time required for non-teaching activities (arriving, eating, leaving); figured at 115 minutes per day.
Actual teaching time	The amount of time in which each S was being taught, i.e. engaged in some type of structured teaching occasion.

The calculations presented graphically in the following tables demonstrate the management of teaching at the CLDC, both in terms of time (teaching economy) and in terms of environmental manipulation (teaching strategy). Section II outlines the rationale for making use of a number of different types of teaching arrangements, geared to maximize the acquisition, maintenance, or display of behaviors. The breakdown shown in these tables shows the proportion of time allotted to each type of teaching occasion for each child throughout his period of enrollment.

SUMMARY OF MEANS

CLDC open for	87D*	CLDC open for	217.5H*
Mean N of days present per S	52.8D	Mean N of hours present per S	132H
		Mean available teach. t.	101.7H
Mean N per S of R-sessions	15.5	Mean total time of Rs	2.57H
I	29.6	Is	4.9H
T	45.4	Ts	7.6H
P	45.0	Ps	7.5H
Mean N of indiv. T.O. (R+I) per S	45.1	Mean total time per S of indiv. T.O.	7.5H
Mean N of group T.O. (T+P) per S	90.4	Mean total time per S of group T.O.	15.08H
Mean N of T.O. (R+I+T+P) per S	135.5	Mean total time per S of total T.O.	22.58H
Mean N of indiv. T.O. per day, per S	0.75	Mean indiv. teach. time per S, per day	7.5M*
Mean N of group T.O. per day, per S	1.62	Mean group teach. time per S, per day	16.2M
Mean N of T.O. (total) per day, per S	2.36	Mean total teach. time per S, per day	23.6M
		Available teach. time per day	115M
		Total time per day	150M

*D = days; H = hours; M = minutes

TABLE A

Attendance of subjects from day of enrollment; days present out of total possible CLDC days, November, 1967 to May, 1968 Session.

Subject	N of days present	N of days S was enrolled in CLDC	% of days present vs possible CLDC days
Arnold	74	87	85.06
Bill	68	72	94.44
John	79	87	90.80
Kathy	78	87	89.65
Liva	82	87	94.25
Ronny	23	87	26.44
Sean	21	21	100.00
Veronica	14	19	73.68
Vincent	25	87	28.74
Yvonne	64	87	73.56
Mean	53	72.1	75.66

TABLE B

Number of (R), (I), (T), (P) teaching occasions per child, and total number of teaching occasions, from date of enrollment.

Subject	Total N of Rs.	Total N of Is.	Total N of Table Times.	Total N of Telephone Times.	Total N of Teaching Occasions.
Arnold	20	38	62	62	182
Bill	24	51	65	65	205
John	30	44	73	73	220
Kathy	36	48	69	69	222
Liva	17	51	71	67	206
Ronny	2	5	13	13	33
Sean	6	12	19	19	56
Veronica	2	3	9	9	23
Vincent	5	7	16	16	44
Yvonne	13	37	57	57	164
Total	155	296	454	450	1355
Mean	15.5	29.6	45.4	45	135.5

TABLE C

Number of individual (R + I) and group (T + P) teaching occasions and total number of teaching occasions (R + I + T + P) versus number of days present, per child from date of enrollment.

Subject	N of CLDC days present.	Total Individual Teaching Occasions (Rs + Is).	Total Group Teaching Occasions (Ts + Ps).	Grand Total of Teaching Occasions (Rs + Is + Ts + Ps).
Arnold	74	58	124	182
Bill	68	75	130	205
John	79	74	146	220
Kathy	78	84	138	222
Liva	82	68	138	206
Ronny	23	7	26	33
Sean	21	18	38	56
Veronica	14	5	18	23
Vincent	25	12	32	44
Yvonne	64	50	114	164
Total		451	904	1355
Mean	53	45.1	90.4	135.5

TABLE D

Number of teaching occasions and days present per child from date of enrollment; ratio of teaching occasions to days present (i.e., mean number of teaching occasions per day per child).

Subject	N of days present.	Grand Total of Teaching Occasions	N of Individual Teaching Occasions (R + I) per day present.	N of Group Teaching Occasions (P + T) per day present.	Total (R + I + T + P) Teaching Occasions per day present.
Arnold	74	182	0.78	1.67	2.45
Bill	68	205	1.10	1.91	3.01
John	79	220	0.93	1.85	2.78
Kathy	78	222	1.07	1.77	2.84
Liva	82	206	0.82	1.68	2.51
Ronny	23	33	0.30	1.13	1.43
Sean	21	56	0.85	1.80	2.66
Veronica	14	23	0.35	1.29	1.64
Vincent	25	44	0.48	1.28	1.76
Yvonne	64	164	0.78	1.78	2.56
Total		1355			
Mean	53	135.5	0.75	1.62	2.36

TABLE E

Total attendance time per child in days and hours, and total available teaching hours per child.

Subject	N of days present.	Total time in hours spent at CLDC.	Available teaching time in hours.
Arnold	74	185	141.8
Bill	68	170	130.3
John	79	197.5	151.4
Kathy	78	195	149.5
Liva	82	205	157.1
Ronny	23	57.5	44
Sean	21	52.5	40.2
Veronica	14	35	26.8
Vincent	25	62.5	47.9
Yvonne	64	160	122.6
Total			
Mean	53	132	101.7

TABLE F

Distribution of total actual teaching hours among types of teaching occasions, per child from date of enrollment.

Subject	RABbit Room sessions in hours.	Individual Teaching Occasions in hours.	Total Non-Group Teaching (R + I) in hours.	Table Time in hours (t).	Phone Time in hours (P).	Total Group Teaching (T + P) in hours.	Total Group + Non-Group Teaching (R + I + T + P) in hours.
Arnold	3.3	6.3	9.6	10.3	10.3	20.6	30.2
Bill	4.0	8.5	12.5	10.8	10.8	21.6	34.1
John	5.0	7.3	12.3	12.2	12.2	24.4	36.7
Kathy	6.0	8.0	14.0	11.5	11.5	23.0	37.0
Liva	2.8	8.5	11.3	11.8	11.2	23.0	34.3
Ronny	0.3	0.8	1.1	2.2	2.2	4.4	5.5
Sean	1.0	2.0	3.0	3.2	3.2	6.4	9.4
Veronica	0.3	0.5	0.8	1.5	1.5	3.0	3.8
Vincent	0.8	1.2	2.0	2.7	2.7	5.4	7.4
Yvonne	2.2	6.2	8.4	9.5	9.5	19.0	27.4
Total	25.7	49	75	76	75	150.8	225.8
Mean	2.57	4.9	7.5	7.6	7.5	15.08	22.58
Range	6.0-0.3	8.5-0.5	14-0.8	12.2-1.5	12.2-1.5	24.4-3.0	37-3.8

TABLE G

Total hours of actual teaching time per child, and percentage out of total available teaching hours.

Subject	Available teaching time in hours.	Total Group + Non-Group Teaching in hours (Rs + Is + Ts + Ps).	Total Non-Group Teaching (R + I) in hours.	% of teaching (R + I + T + P) out of available time.
Arnold	141.8	30.2	9.6	21
Bill	130.3	34.1	12.5	26
John	151.4	36.7	12.3	24
Kathy	149.5	37.0	14.0	24
Liva	157.1	34.3	11.3	21
Ronny	44	5.5	1.1	13
Sean	40.2	9.4	3.0	23
Veronica	26.8	3.8	0.8	14
Vincent	47.9	7.4	2.0	15
Yvonne	122.6	27.4	8.4	22
Total		225.8	75	
Mean	101.7	22.58	7.5	20.3
Range	157.1-26.8	37-3.8	14-0.8	26-13

Teaching: Tactics, Apparatus, and Materials

The general area of what has been called "matching to sample" has been the subject of extensive research in animals and in a variety of populations of children; but it has been viewed primarily in terms of visual or tactile behaviors. There are, however, a number of possible extensions of matching behavior to the field of verbal behavior, in terms of both receptive and productive language. From the point of view of productive language, for example, the basic paradigm of echoic verbal behavior--teacher provides model, pupil echoes model--can be looked upon as a special case of matching to sample. From the point of view of receptive language, the *verbal controls* for matching to sample call for at least as much study as the *verbal components* that are the concern of cognitive studies. Several experiments on the establishment of matching-to-sample behavior were carried out at the CLDC, and resulted in a series of matching programs designed to establish a variety of behaviors. With the programs on the following pages matching and tacting behaviors were established with respect to staff pictures, children's pictures, pictures of play equipment and reinforcement devices, colors, objects, numbers, shapes, and name cards. The matching programs are described on the following pages; one program is described and illustrated in detail.

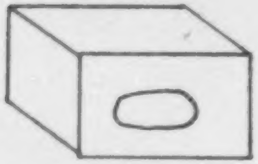
RABbit Room programs are given on the following pages in script format. The upper right corner of the first page indicates required staff and materials, Requisite Antecedent Behaviors, physical arrangement of subject and teacher, array of stimulus items, and terminal behavioral objective of the program.

The script is written in terms of verbal and visual controls presented by the E. Verbal-vocal controls are given in quotation marks, visual or tactile controls in boxes. Additional controls required only if S does not make a criterion response are given in brackets [ ]. Criterion responses are indicated on the right side of the sheet.

MYSTERY MATCHING BOX 1

CLDC Program

Materials: Matching Box; 2 teaspoons; 2 blunt, dull knives; 2 small forks; 2 wooden cubes, 1 in.; 2 ping pong balls; 2 boxes, jeweler's gift, approx. 1-1/2 in.; and M&M candy.

* 	"There is something inside this box that you can't see. If you put your hand in the hole, you can feel what's inside. Can you show me where the hole is?"	(any manner of pointing)	
(Teaspoon in the box)	"Put your hand in the hole, and take out what's inside the box."	--retrieves--	Verbal reinforcement "Good!"
	"What is it?"	"Spoon"	(Prompt if needed) "That's right!"
	"Will you give me the spoon, please?"	--gives--	"Thank you!"
(E puts a knife in the back of box)	"There's something else in the box now. Take it out!"	--retrieves--	"Fine!"
	"What is it?"	"Knife"	"Yes! That's a knife!" (or prompt model)

*Rear of box has hinged door.

MYSTERY MATCHING BOX 1 (cont'd)

	"Will you give me the knife, please?"	--gives--	"Thank you!"
(Spoon and knife inserted in box from rear.) E shows S a spoon.	"Here is a spoon. Can you put your hand in the box and find another spoon?"	--retrieves--	
(When spoon is retrieved ask S to show it)	"What have you got?"	--(a, another, spoon)	Verbal reinforcement
	"Will you give me the spoon, please?"	--gives--	"Thank you!"
(Spoon and knife inserted in box from rear) E shows S knife.	"Here is a knife. Can you find another knife in the box?"	--retrieves--	Verbal reinforcement
	"Will you give me the knife, please?"	--gives--	"Thank you!"
(Box contains knife, fork, and spoon) Show S a fork.	"Here's a fork. Put your hand in the box and take out a fork just like this one."	--retrieves--	Verbal reinforcement.
	"Will you give me the fork?"	--gives--	"Thank you."

MYSTERY MATCHING BOX 1 (cont'd)

(Box contains knife, fork, and small cup) Show S the cup.	"Can you find something in the box just like this?"	--retrieves--	Verbal reinforcement
	"Will you give me the cup, please?"	--gives--	"Thank you!"
(Small block: 1 inc. cube and spoon and knife in box) Show cube.	"Now look what I've got. Can you find something in the box that matches this?"	--retrieves--	Verbal reinforcement
	"Will you give me the block, please?"	--gives--	"Thank you!"
(Ping pong ball, fork and knife in box) Hold up ball.	"Can you find something in the box that matches this?"	--retrieves--	Verbal reinforcement
	"Will you give me the ball, please?"	--gives--	"Thank you!"
(Cardboard jeweler's giftbox, with M&M inside and ball and spoon in box) Hold up giftbox.	"Now here's a big surprise! Can you find something in the box that matches this?"	--retrieves--	Verbal reinforcement
	"If you open the little box, you may have what's inside."	S opens box, discovers candy, and is permitted (encouraged to eat it.	

TERMINATE PROGRAM	We'll do it again tomorrow (or soon)."

CLDC PROGRAM: MATCHING GAME I

Es: 1

RAB: Attend to photographs

Material: Pictures of CLDC children

Locale and topology:
Dining room floor

A	"We're going to play the picture game!"	
B	Give each S a photo of himself. Be sure photo is properly oriented so that child can see the picture right-side-up.	"I'm going to give everybody a picture of himself."
C	Array of three pictures, one of which is photo of S, on the floor. Pile of pictures beside E.	
D	Approach S.	"May I see your picture, ______?" "Show me your picture."...Reinforce verbally.

E	"I have ANOTHER PICTURE of you. Can you find it?"	Show S the array. Any means of pointing is acceptable. Reinforce verbally.
F	"Can you find your picture?" ... "Show me your picture."	
G	"Point to your picture."	
H	"There are two pictures of S." "Put the pictures of S together."	Model [S1] [S2] [3] [S1]
H_1	No model.	
I	"Here's a picture of different S. "Put the pictures of ____ together."	Show S the array of pictures which contains a match.
J	Array of photos, S1, S2, S3; one picture is of S himself.	

THEN FRAME I FOR EACH OF THE PICTURES

I	"Here's a picture of different S. "Put the pictures of ____ together."	Show S the array of pictures which contains a match.

K Array of J plus matching pictures arranged thus:

```
        [S1]  [S2]  [S3]
[S3] ----------------
[S1] ----
[S2] ----------
```

"Put together the pictures that match."

L Array of J.

Display one S picture.

"Show me the picture that matches this."

The same for two other pictures.

CLDC PROGRAM: TABLE TIME I

Es: 2

RAB: Discrimination of one's own photo; "Good morning;" "Fine"

Material: S's picture

Locale: Dining Room

A	"Come and stand in line" E calls Ss by name	
B	"Come into the dining room and let's see if we can find your picture."	Accompanies or leads S to DR table with picture array.
C	Show table with picture array.	a) "Can you find the picture of _____?" b) ("Which picture is yours?" c) ("Point to your picture.")
D	"Good boy/girl!" (Verbal response for S's response) "Now go back to the line."	
	RUN ALL Ss THROUGH A, B, C, D. THEN	
E	"____" (S's name) go into the dining room and sit down in front of your picture.	

F /S finds picture/

G /S sits down/

H "Put your hands on the table like this." (S_sR is verbally reinforced.) Model

---

I "Good morning."
"Say, 'good morning'."

J a) "How are you?"

b) ("Can you say 'Fine'?")

c) ("How are you?")

CLDC PROGRAM: TABLE TIME II

Es: 2

RAB: Table Time I

Material: S's picture

Locale: Dining [illegible]om

A "Come and stand in line."
E calls Ss by name.

E "___" (S's name) go into the dining room and sit down in front of your picture."

F /S finds picture./

G /S sits down./

H_1 Motor
Model (No verbal S^D) "___" verbal prompting.

I "Good morning."
"Say 'good morning'."

J a) "How are you?"

b) ("Can you say 'Fine'?")

c) ("How are you?")

CLDC PROGRAM: TABLE TIME III

Es: 2

RAB: Table Time II

Material: color plaques

Locale: Dining Room

A	"Come and stand in line." E calls Ss by name.	
E	"Find the bench that matches this color."	Hand S colored plaque.
F	When S finds bench, "Fine! Now sit down on the ___ (color) bench."	
G	/S sits down./	
H_1	Motor Model (No verbal S^D)	"____" verbal prompting
I	"Good morning." "Say, 'good morning'."	
J	a) "How are you?" b) ("Can you say 'Fine'?") c) ("How are you?")	

CLDC PROGRAM: TABLE TIME IV

Es: 2

RAB: Receptive
color tacting
Table Time III

Material: Colored
benches

A	"Come and stand in line." E calls Ss by name.	
E	"___" (S's name) go into the dining room and sit down on the ____ (color) bench.	
F	/S finds bench/	
G	/S sits down/	
H_1	Hands on Table Motor Model (No verbal S^D)	"___" verbal prompting
I	"Good morning." "Say 'good morning'."	
J	a) "How are you?" b) ("Can you say 'Fine'?") c) ("How are you?")	

CLDC PROGRAM: TABLE TIME V

Es: 2

RAB: Receptive tacting of numbers

Material: Numbered benches

Locale: Dining Room

A "Come and stand in line"
E calls Ss by name

E "____" (S's name) go into the dining room and sit down on the bench with the number ____ (1, 2, 3...)"

F /S finds bench./

G /S sits down./

H_1 Hands on Table
Motor
Model (No verbal S^D)

"___" verbal prompting

I "Good morning."
"Say 'good morning'."

J a) "How are you?"

b) ("Can you say 'Fine'?")

c) ("How are you?")

CLDC PROGRAM: TABLE TIME VI

Es: 2

RAB: Matching name cards

Locale: Dining Room

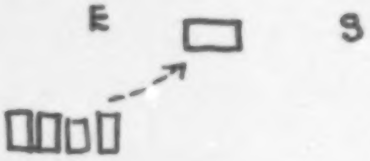
A	"Come and stand in line." E calls Ss by name.	
E	"Find the name card that matches this."	Hand S his own name card.
F	When S finds card "Fine! Now sit down at your place. May I have your name card please?"	
G	/S sits down./	
H_1	Hands on Table Motor Model (No Verbal S^D)	"___" verbal prompting
I	"Good morning." "Say 'good morning'."	
J	a) "How are you?" b) ("Can you say 'Fine'?") c) ("How are you?")	

Behavior: Counting practice

RABs: Count 1 - 3

Materials: wooden blocks

Visual control:



Verbal control:

1. E puts down one block. "How many is this?"

2. E puts down two blocks. "How many is this?"

3. When three blocks have been put down in front of S, E asks, "Can you give me one block? (two, three)"

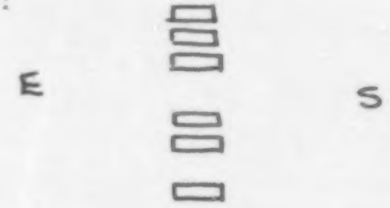
4. E puts down three blocks. "Can you take one block and give me two?"

Behavior: Counting practice

RABs: counting 1 - 3

Materials: 6 small wooden blocks

Visual control:



Verbal control: "Point to the 2 blocks."
"Point to the 3 blocks."

"Give me 1 block."
"Give me the 2 blocks."

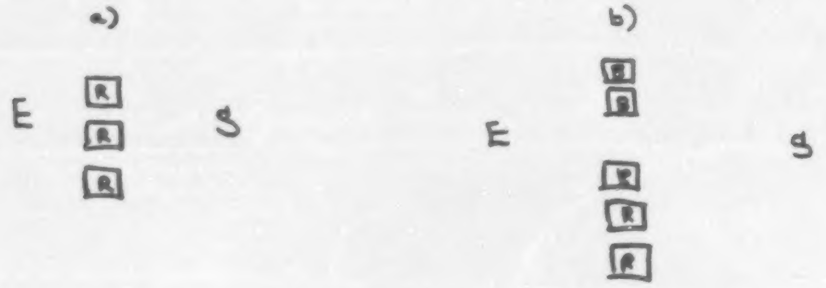
Reinforcement: Verbal praise

Behavior: Counting and color tacting

RABs: colors

Materials: color plates

Visual control:



Verbal control:

1. E points and says, "One, two, three."

2. "Can you point and say, 'One, two, three'?" E and S point and count together.

3. E points, "What's this?" S: "one, (or two, or three)."

4. E: "Now you do it." S points and counts.

5. E: "Can you give me one plate?" "Can you give me two plates?" "Give me three plates."

6. When E has collected plates, he puts one down in front of S: "How many plates do you have?"

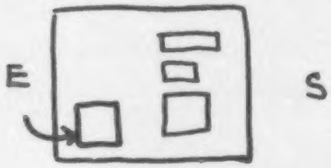
7. E then mixes colors and puts down plates. "How many red plates do you have?" "How many brown plates?", etc.

Behavior: Size discrimination

Materials: 3 pairs of matching blocks

Visual controls: 1. array of 3 blocks of different sizes

2. E holds up a block which matches one on table in size



Verbal control: 1. *Point to the block that matches this one*.

2. After S responds by pointing appropriately, *Put the matching blocks together*.

Behavior: Line drawing I (Fig. 20)

Materials: crayons, paper

Visual control: E draws straight line on paper with light-colored crayon.

Verbal control:

1. "Can you take your crayon and draw over that line?"
2. "Can you make a line like that by yourself?"

This can be extended to model tracing of shapes, pictures, etc.

Behavior: Line drawing II (Fig. 21)

Materials: crayons, paper

Visual control: E draws two dots on paper, puts right index finger on upper dot.

Verbal control:

1. "Can you put your crayon where my finger is?"
2. (E puts left index finger on other dot.) "Can you bring your crayon down to touch my finger?"

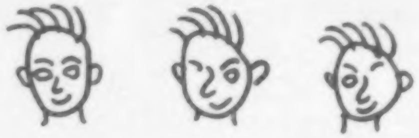
Behavior: Drawing Freddy's face

RAB: body tacting, line drawing

Terminal B: Draw a face on a blank piece of paper under control of verbal instruction, "Draw Freddy's face for me," with distinguishable features: outline of head, eyes, nose, mouth (hair, eyebrows, ears).

Materials: prepared stencils of face, in sequence (see below).

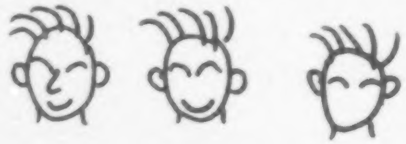
Visual control: Freddy's Face I:



Verbal control: This is Freddy. (receptive baselines)
Can you say "Freddy?"
Can you point to Freddy's face?
------------------------ eyes?
------------------------ hair?

The program progresses from Freddy's Face I, where a completed drawing is the control, through sequences of Freddy's face in which an additional feature is missing. The child is first shown how to hold the pencil, and shaped to approximate more and more closely the features drawn on the model.

Sample of Freddy's Face II:

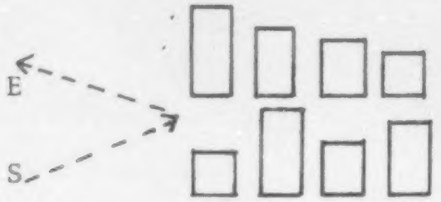


Verbal control: "Can you tell me (point to) what's missing from Freddy's face?"

Behavior: Size discrimination

Materials: 4 blocks of different sizes

Visual control:



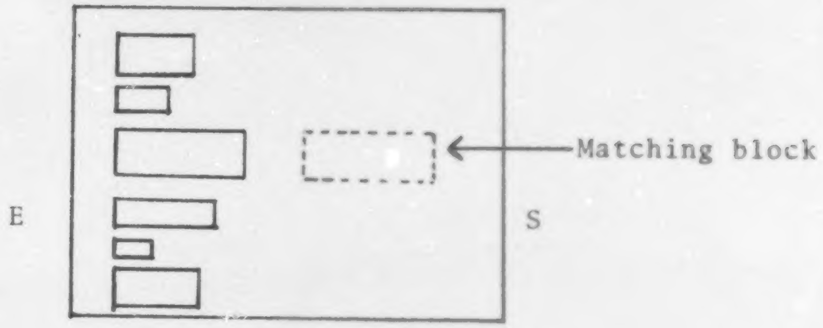
1) descending sizes or

2) random array

Verbal control:
1. Go and get the smallest one.
2. Go and get the biggest one.
3. Go and get the bigger one.

Reinforcement: Verbal praise

Block Matching Game



Procedure:

A. Visual control: array of blocks on table.

B. Visual control: presentation of a block (to be matched); E holds up a block.

C. Verbal control: "Point to the block that matches this one."

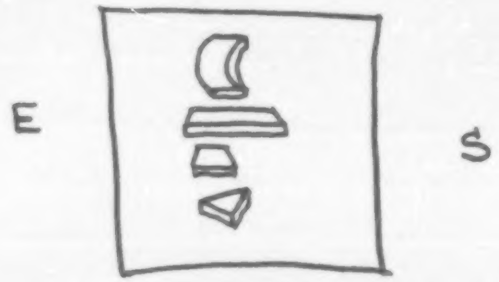
D. Verbal confirmation.

E. Verbal control: "Put the matching blocks together."

Behavior: Shape tacting

Materials: blocks of different shapes

Visual controls:



Verbal controls: 1. This block is square. Can you point to the square block?

2. Can you point to the curved one? the rectangle? the triangle?

Tower Game

Behavior: tower building, doll-tacting

Materials: wooden blocks, pliable rubber dolls (policeman, man, woman, children, mailman, etc.)

Visual control: blocks in pile. E and Ss build tower with opening at bottom.

(See Fig. 22)

Verbal control: 1. Now let's put the woman in. Now let's put the policeman in, etc.

2. This can be extended to house building, requiring Ss to name different parts of house, putting figures in the house and requiring Ss to name their activities (sleeping, eating in the kitchen, etc.)

Free Play: Block Building (Fig. 23)

Behavior: Body tacting I

RAB: tacting

Materials: none

Visual control: E and S face each other

Verbal control: 1. E points: "This is your nose."
2. "Can you say 'nose'?"
3. Points: "What's this?" (nose)

Reinforcement: verbal praise

Behavior: Body tacting II

RAB: tacting

Materials: none

Visual control: E standing and Ss lying in a circle

Verbal control: E asks Ss to lift specified part of body.

(See Fig. 24)

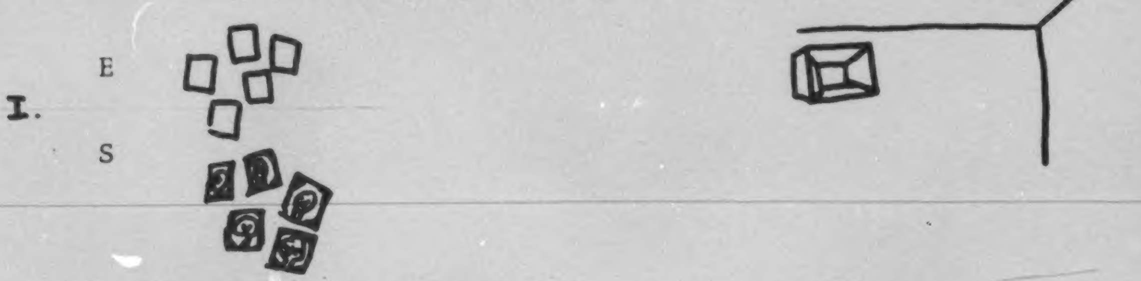
Behavior: Multiple verbal controls

RAB: color and picture tact

Materials: color plates and kiddie pictures, wooden box

Visual control:

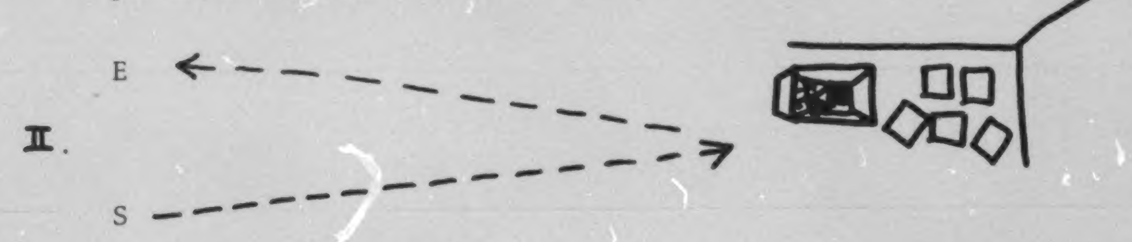
5 color plates and 5 picture cards on floor



Verbal controls: 1. Put Arnold's picture in the box and the red plate in the corner of the room.

Visual control:

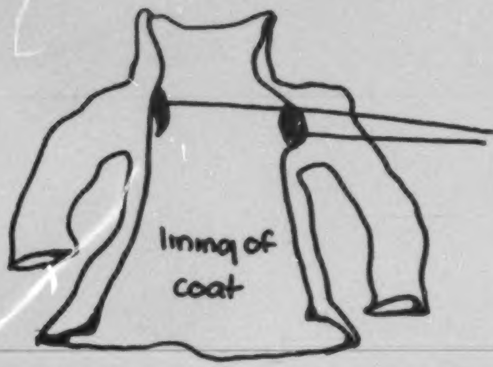
5 color plates in corner of room and 5 kiddie pictures in box



Verbal controls: 1. Get me the picture of Liva from the box, and the yellow plate from the corner.

Coat Game (Self-dress activity)

S ← Stands here and bends over



Armholes of coat.

1) S's coat is laid open on the floor, so that when looking at it from a standing position the lining of the coat faces up.

2) E gives a model demonstration of the procedure:

   a) Stand at the top of the coat (collar) facing the coat.

   b) Bend over and put hands in the armholes of the coat.

   c) Lift the coat off the floor and flip it over your head.

   d) Fasten any buttons or zippers, etc.

Contingency Management Games

The setting, materials and structure of contingency management procedures are dependent upon the goal of the particular teaching occasion. In the group contingency management games in the playroom, the goal is most often to generalize teaching from other settings to the loosely controlled setting of the playroom. Such activities as the Tunnel game, the Tub game, and so on, are structured so that any type of teaching material may be used as a basis for setting contingencies. At other times, the goal is the production of verbal responses of almost any sort. Conversation among E and Ss about their homes, what they like to play, whether they have pets, provides opportunity for Ss to produce verbally under no strict control and in the presence of other Ss in an informal situation. Story time provides the same kind of opportunity, where Ss interact with each other under loosely controlled conditions. On the other hand, some games require verbal production of particular responses, though in a more informal setting than R-sessions. In the Tower game, for instance, verbal controls are not in a strict sequence, but S's responses must be appropriate to the particular S^D.

The following games are examples of Contingency Management applied to (1) specific learning tasks; (2) preschool management. That is, if Ss have reached a particular learning task in the RABbit Room, this is generalized by introducing it into contingencies in the playroom area. Further, contingency management may be applied at any time, permitting all types of activities to serve as teaching occasions. This maximizes total teaching time available within the preschool setting.

Contingencies can be applied to any learning task, once activities which are found to be reinforcing to the S are identified and made available.

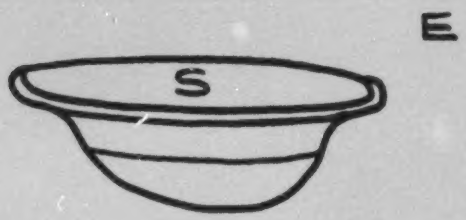
The following games were devised with common playroom equipment. Specific contingencies are given as examples in these descriptions; but it should be stressed once again that relevant substitutions may always be made. The games themselves provide structures around which any teaching task may be organized.

Tub Game (Fig. 25 and 26)

Behavior: general

Materials: metal tub

Visual: S in tub, E beside it



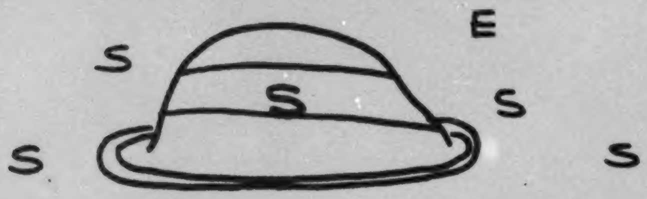
Verbal control:
1. Can you say Spin me?
2. Say Spin me fast, Spin me slow, etc.
3. Any other contingency may be set up: articulatory shaping, counting, body tacting.

Who's Under the Tub?

Behavior: productive naming

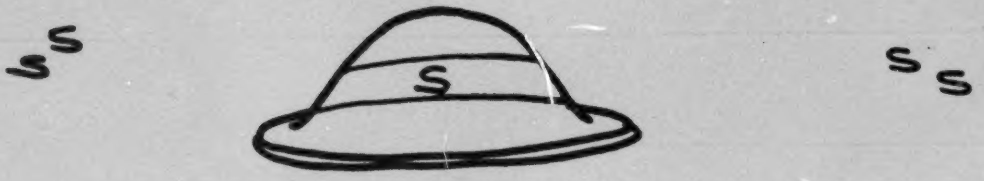
Materials: metal tub

Visual: Ss seated around tub, turned upside down
E puts one S under tub.



Verbal control:

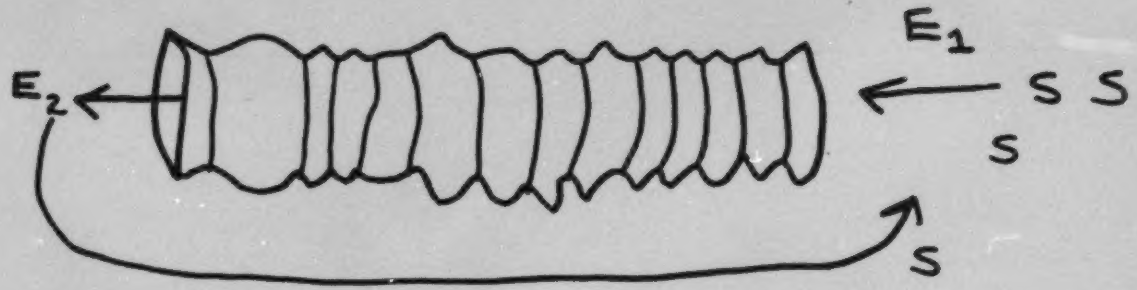
1. Who's under the tub?
2. Ss guess, and when correct guess is made, another S gets a turn under the tub.
3. This can be further complicated by having Ss hide their eyes while one S is hidden, and really have to guess.



Behavior: general

Materials: Tunnel, 2 Es

Physical set-up:



Procedure:

1. All Ss line up behind E_1
2. E_1 sets up contingency, e.g., "Say One, two, three."
3. After S responds, he goes through the tunnel.
4. When S reaches end of tunnel, E_2 repeats contingency of E_1 or provides new contingency, e.g., "Say I wanna come out please."
5. After S responds, he leaves the tunnel and goes around to the entrance again.

The game continues as long as children continue to meet contingencies.

Tunnel-Bridge Game

Behavior: generalization

Materials: Tunnel, 3 Es, inverted rocking boat

Physical set-up:

(See Fig. 27)

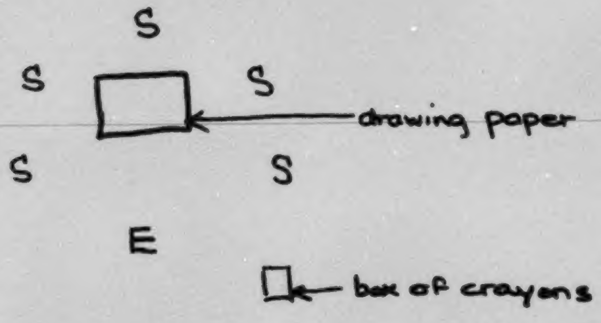
Procedure:

As in Tunnel game, with additional contingency set up by E_3 at inverted rocking boat. When S meets contingency, he is permitted to walk up over the rocking boat "bridge."

Discrimination Training

Much training was directed toward expanding verbal production with respect to properties of materials, including size and shape of blocks, tacting different dolls, etc. These activities extended R-sessions to other materials, in the playroom setting.

Color Training Exercise



1) E shows Ss 1 crayon.

2) E asks what color it is. (Group responds (ex. red).

3) Each S is asked to choose 1 named crayon out of 3. (E holds in hand a red crayon, blue crayon, and green crayon.) After criterion response, each S is given the crayon and S draws a circle of criterion crayon color.

NOTE: If an S can't tact the crayon to criterion on the first trial:

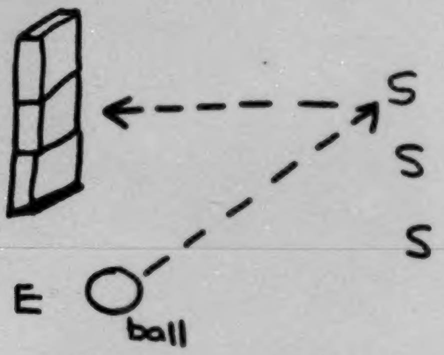
1) E to S: "This is a red crayon."
"Can you point to the red crayon?"
"Can you point to the red crayon and say 'red'?"
"What color is this crayon?"
S: "Red."

Ball Rolling

Behavior: ball-rolling

Materials: rubber ball, large lightweight (cardboard) blocks

Visual control: (Fig. 28 and 29)

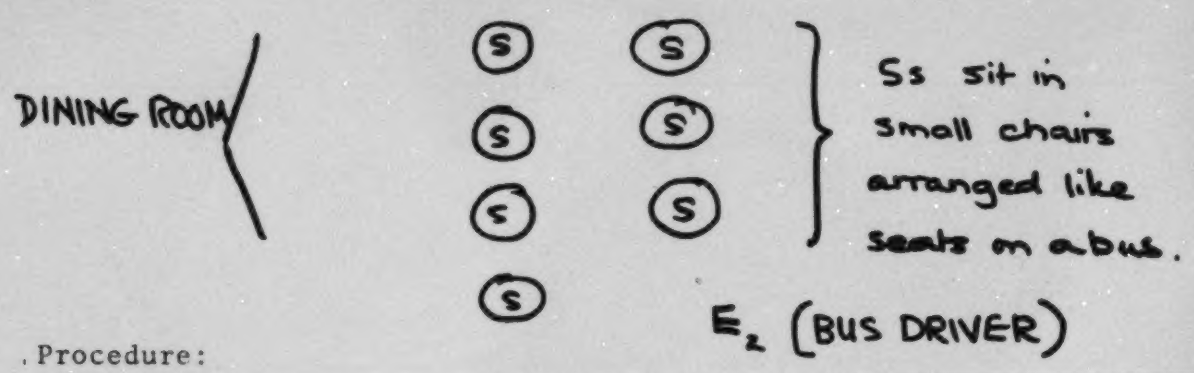


Verbal controls:
1. Can you say, "I wanna knock the blocks over?"
2. When S responds to model, E rolls ball to him. S rolls ball and knocks down blocks.
3. E restacks blocks, and repeats with other Ss.
4. Model can be made more complicated, for instance: "I wanna roll the ball and knock over the blocks."

Reinforcement: rolling ball, knocking blocks down.

Bus Game

Behavior: wash-up and clean-up activity (Fig. 30)



Procedure:

1. E_1 announces that if everyone wants to get tickets (mini-wipes held up in E's hand as a visual stimulus) to ride on the bus that we have to first clean up the playroom.
2. E_1 assigns different tasks of cleaning up to the different Ss. (ex. "John, can you put all the rubber dolls on that shelf?")
3. When each S has completed his specific task or tasks, E_1 then gives S a "ticket" for the bus and S is told to go give his ticket to the bus driver (E_2).
4. E_2 takes the ticket from S, rips off the top and gives the enclosed mini-wipe to S.
5. S then takes the mini-wipe and sits down on the bus. S then washes his face and hands.
6. After all Ss are seated on the bus and have completed the self-washing procedure, they are then directed to the dining room for lunch.

Telephone Times

A set of functioning telephones was installed, running between the dining room and playroom. At the end of Table Time and Story Time, each child (in the dining room) was taught to lift the telephone receiver with his left hand, hold it at the appropriate distance from his ear and mouth, and participate in the following dialogues with the teacher in the playroom. (Fig. 31).

CLDC PROGRAM: TELEPHONE I

Es: 2

RAB:
Motor
Lift phone
Discriminate earpiece from mouthpiece
Hold phone at functional distance
Discriminate cradle of phone
Place handpiece in cradle
Verbal

Artic	Hello	Hello	S^Ds
	Good morning	Good morning	
	Fine	How are you?	
	Goodbye	Goodbye	

Material: 2 phones with recorder

Locale: Dining room for Ss and other room for E_2

A	E_1: "Let's talk to Tom on the telephone."	
B	Accompany S to phone. Guide him to lift phone with left hand.	
C	Support handpiece if necessary for listening and talking position.	E_2: "Hello, ___! This is Tom. Can you say 'Hello'?"

D "Hello."

E E_2: (If S responds to D) "Good morning!" . . . ("Can you say 'good morning' to me?") . . .

F E_2: ("How are you?") . . . ("Fine.")

G E_2: "That's good. I have to go now . . . Goodbye."

("Goodbye.")

H E_1: Guide child to hang up phone.

I Child hangs up./

J Exits under verbal control.

("You may go into the playroom now.")

CLDC PROGRAM: TELEPHONE II

Es: 2

RAB: Telephone I

Material: 2 phones
with recorder

Locale: Dining room
for Ss and
other room
for E_2

A	E_1: "Let's talk to Tom on the telephone."	
C	Support handpiece if necessary for listening and talking position.	E_2: "Hello, ___! This is Tom...Can you say 'Hello'?"
D	"Hello"	
E	E_2: (If S responds to D) "Good morning!" ... ("Can you say 'good morning' to me?")...	
F	E_2: "How are you?" ... ("Fine.")	
G	E_2: "That's good. I have to go now....Goodbye." ("Goodbye")	
I	/Child hangs up./	

J Exits under verbal control.

("You may go into the playroom now.")

CLDC PROGRAM: TELEPHONE III

Es: 2

RAB: Telephone I & II and productive tacting of play-room toys.

Material: 2 phones with recorder

Locale: Dining room for Ss and other room for E_2

A	E_1: "Let's talk to Tom on the telephone."	
C	Support handpiece if necessary for listening and talking position.	E_2: "Hello, ___! This is Tom. Can you say 'Hello'?"
D	"Hello"	
E	E_2: (If S responds to D) "Good morning!" ("Can you say 'good morning' to me?")	
F	E_2: "How are you?" ("Fine.")	
G_1	"That's good. What would you like to play with today?" ______ (Wait for response 5 seconds.)	

G_2 "The slide?" "The rocking boat?" "The blocks?"

G_3 "That's fine. Goodbye."

I /Child hangs up./

Puzzle Tacting I

1) Each S was given a piece of the puzzle to put in the puzzle after tacting the specific piece. (ex. umbrella).

2) The pieces (all 4 from one puzzle) were put face up on the floor about 6 feet away from the Ss.

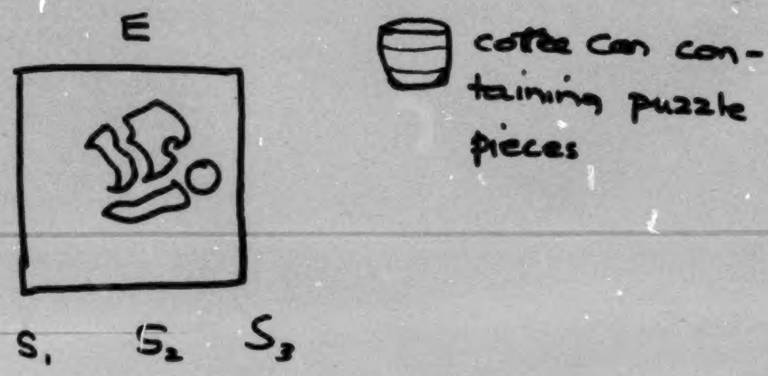
3) E to S, "Can you go find the raincoat?" S brings the raincoat (puzzle piece) back and puts it in the puzzle.

4) Next step, all 4 pieces from one puzzle were put upside down on the floor. E to S, "Can you find the hat?" S brings back the hat (puzzle piece) and puts it in the puzzle.

5) Next, pieces from the two puzzles were put upside down on the floor. Same procedure as in step #4.

6) Pieces from all three puzzles put upside down in the hole of the bottom part of the slide. Same procedure as step #4. Ss occasionally were asked, "What do you want to get?" Ss tact puzzle piece that's missing from the puzzle (ex. hat) and go and find the hat and bring it over and insert it into the puzzle.

Puzzle Tacting II



Procedure:

1) E puts all puzzle pieces in a large empty coffee can.

2) E to S^1, "What puzzle piece do you want to put in this puzzle?" (S scans the puzzle to see what pieces are missing.)

3) S^1, "The hat." (or raincoat, boots, or umbrella.)

4) E to S^2, "Can you shake the pieces and give the can to S?"

5) S^2 gives the can to S^1.

6) E to S^1, "Can you take out the hat and put it in the puzzle?"

7) S^1 takes out the puzzle piece and puts it in the puzzle.

8) Repeat the procedure, rotating step #2 and step #4 with all Ss, until all the pieces are in the puzzle and then repeat with the same or different puzzle or puzzle pieces.

Group Story

Behavior: collaborative story-telling

Materials: none

Physical set-up: Ss sitting around E on floor or table

Verbal control: E tells a line or two of a story, then asks one S a question.

Sample: E: there was a little boy who found a box one day. Arnold, what do you think was in the box?

S_1: A man.

E: Oh! What did the man say? Liva?

S_2: He said "Goodbye."

E: Where was he going to go?

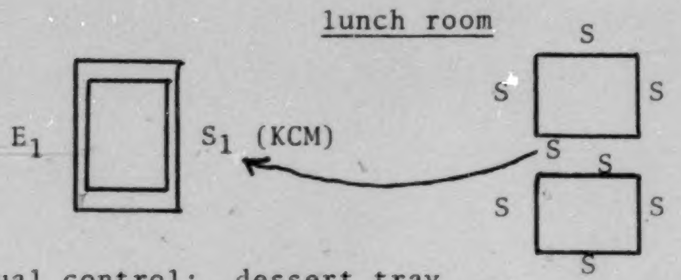
S_3: He went home.

E: What was he going to do there?, etc.

Dessert Contingency Management

A daily activity was called Dessert CM, and provided for both E's and S's setting contingencies for other Ss. Fig. 32 shows the E's cue-board for directing the Kiddie Contingency Management between Ss. In Fig. 33 and 34 Es set the target responses for the children. This activity centered around dessert grew from the observation that many responses can be required from a child before a very high probability behavior, such as eating dessert.

Materials: dessert tray, with choice of desserts, spoons



Visual control: dessert tray

Verbal control: E: "(S_1's name), who do you want to call?"

S_1 calls one of the other Ss to the dessert tray.

E prompts: "Can you ask S_2 whether he wants (peaches) or ice cream?"

S_1 to S_2: "Do you want peaches or ice cream?"

S_2 names (or points) to dessert, which is given to him by S_1.

Additional activities are pictured on the following pages, illustrating modifications or extensions of the games described in more detail on the preceding pages.

First Floor

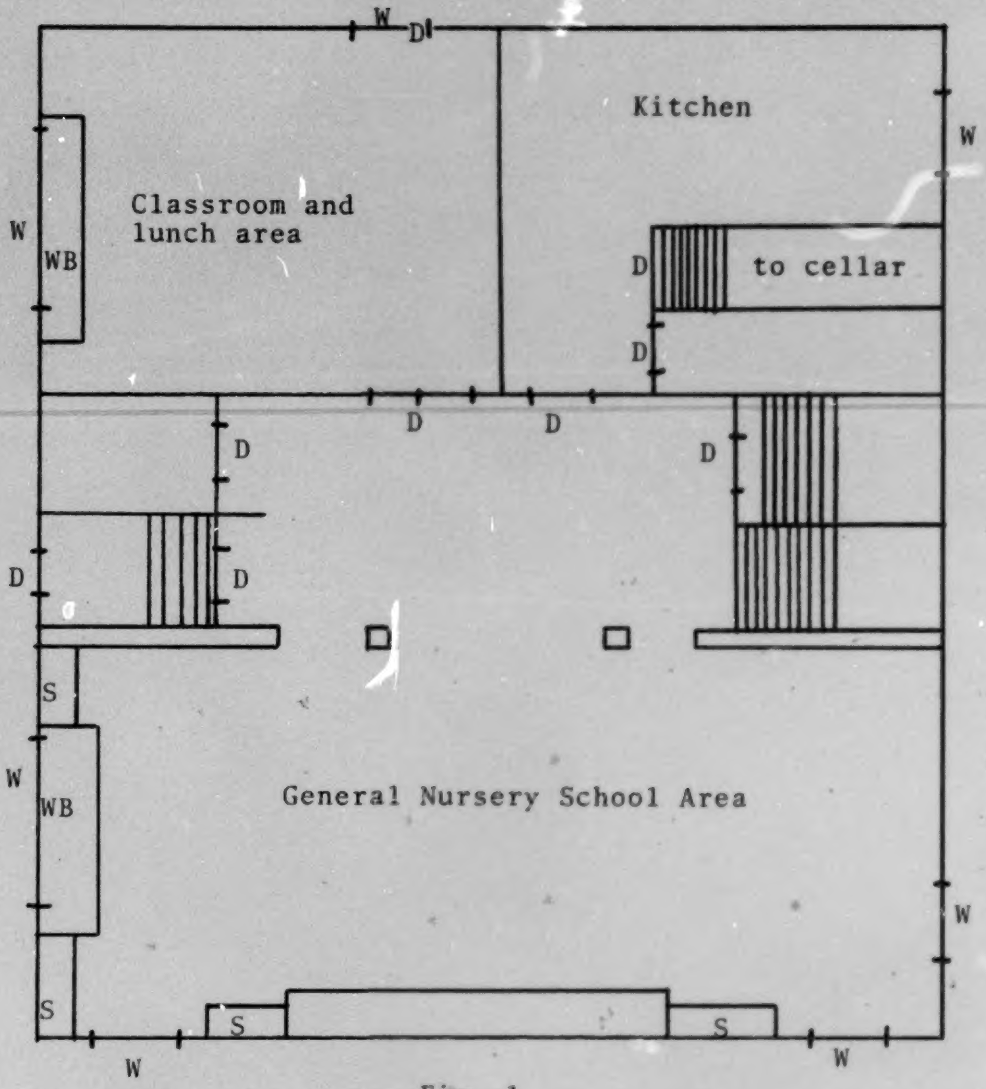


Fig. 1

D = door; W = window; S = shelves; WB = window bench

Second Floor

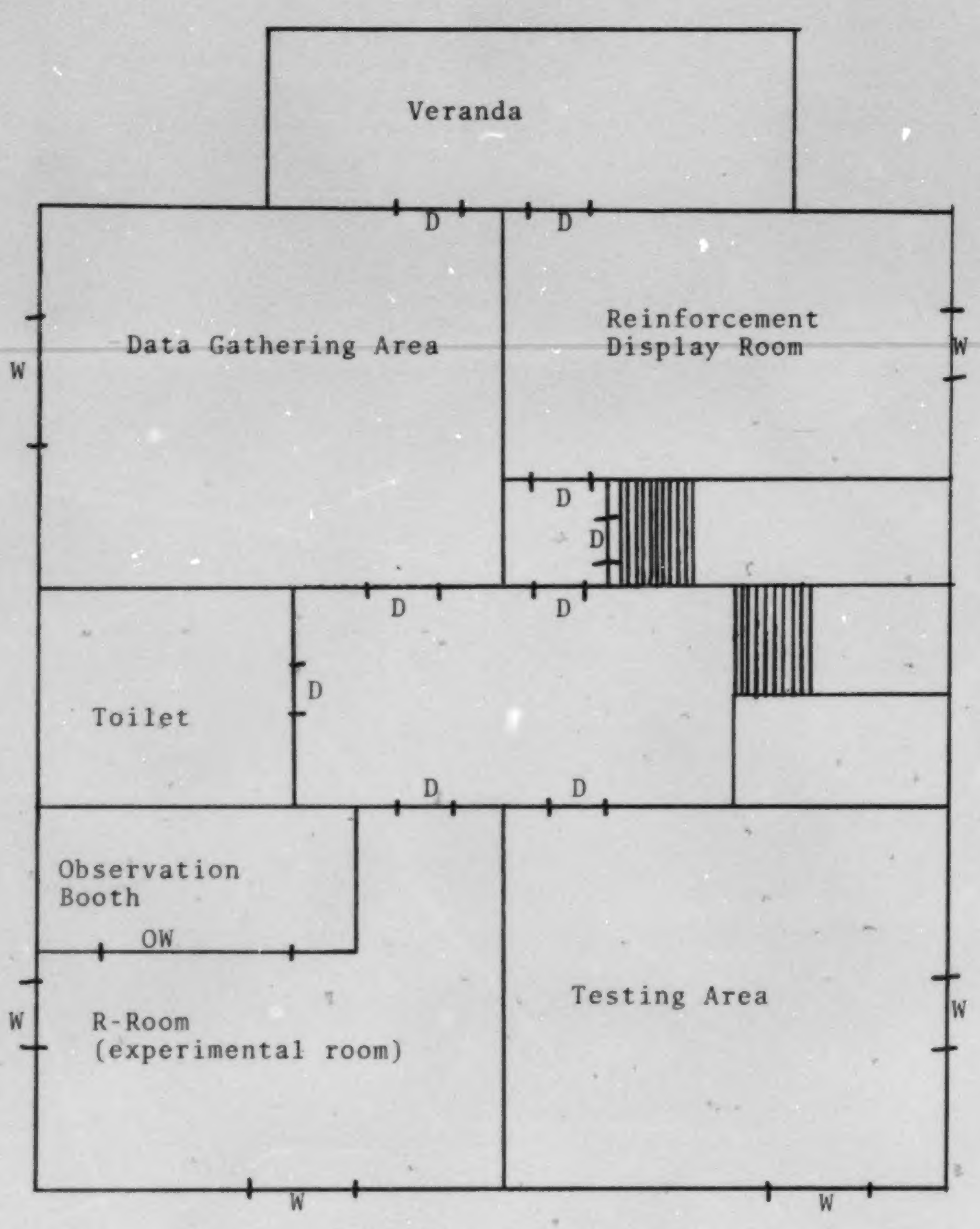


Fig. 2

OW = Observation Window

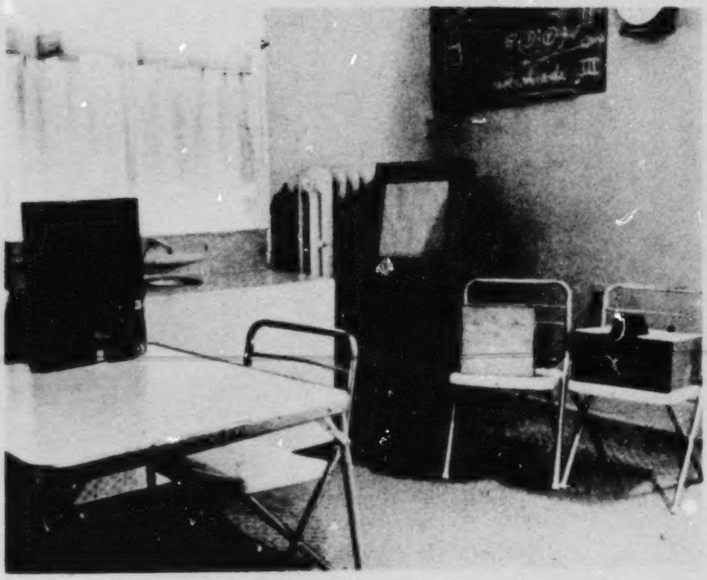


Fig. 3. Typical set-up of the specially designed experimental space called the RABbit Room. Child-size table is at left, with small chairs for Teacher and child. Token dispenser sets on table. Reinforcement devices from left to right: contingent sink (not present for full-length session); movie box, twinkle box, slide box. Cue board is visible at upper right, along with timer.

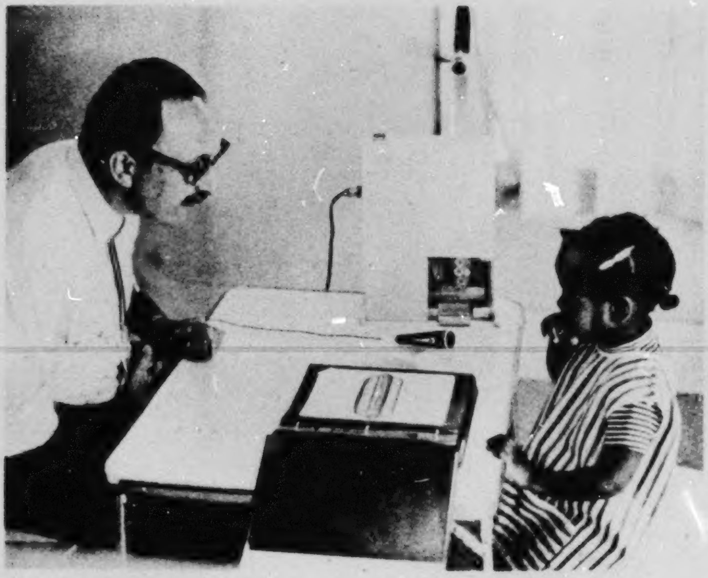


Fig. 4. The SIFT being administered in the RABbit Room.

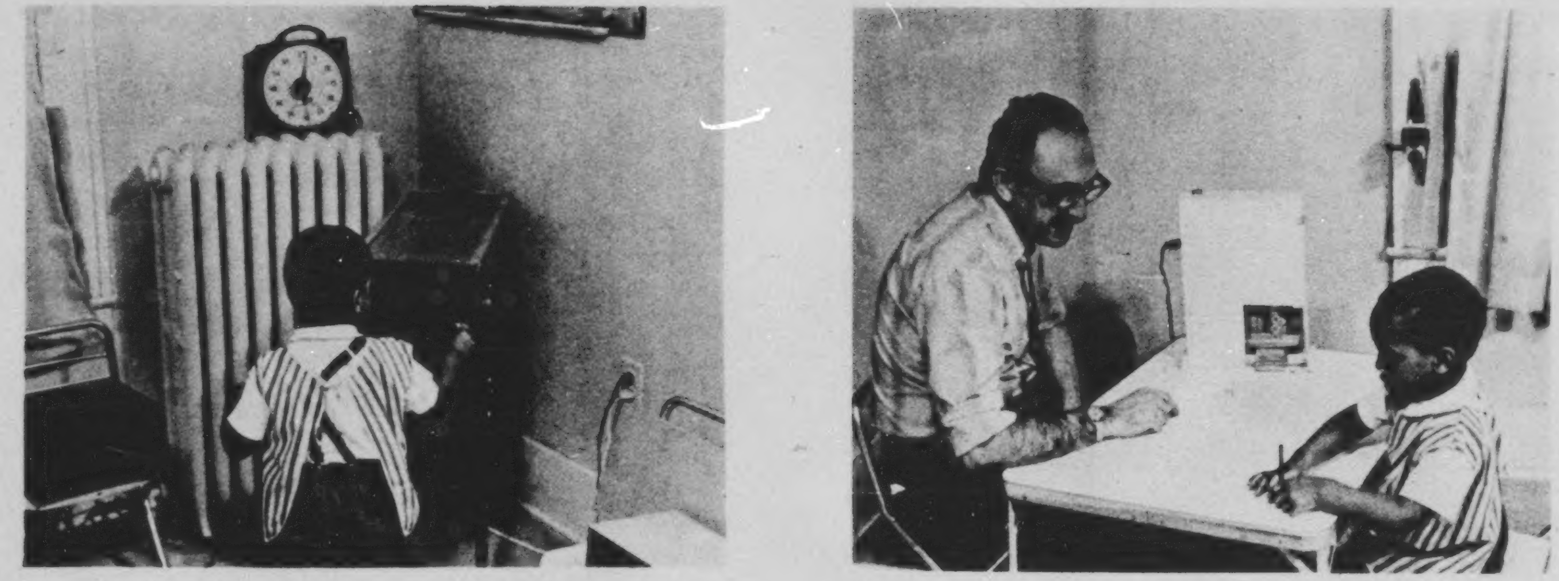


Fig. 5 and 6. RABbit Room adaptation session. Tokens acquire the properties of a secondary reinforcer as they are dispensed to the child, and he is taught to spend them in the reinforcement devices. In Fig. 6 he begins to store tokens by slipping them onto the token storage device.

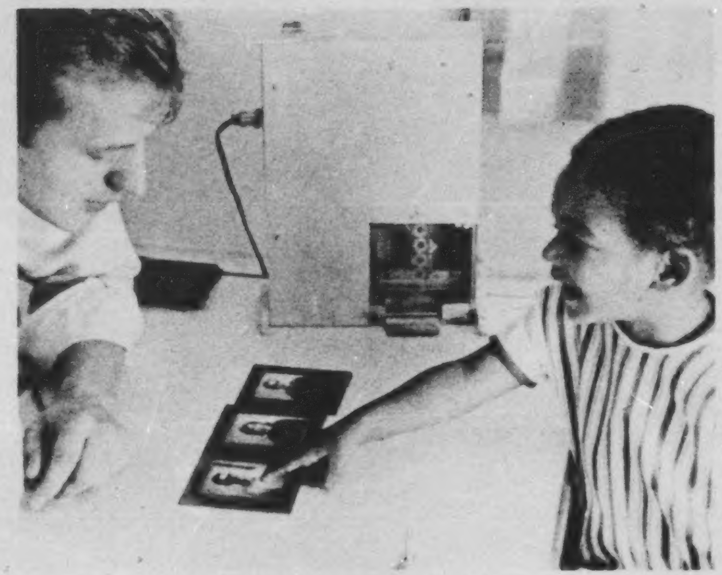


Fig. 7. Receptive tacting of staff photographs. Verbal control is "Point to the picture of Tom."

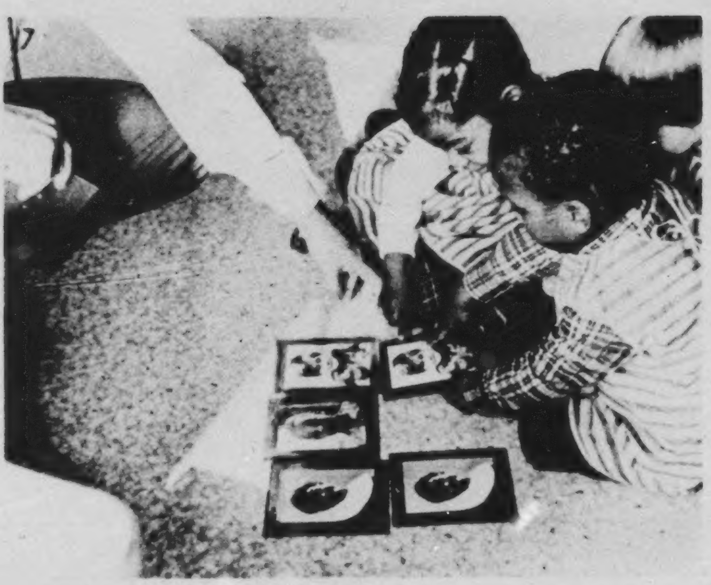


Fig. 8. Matching to sample--photos. The child is asked first to point to the model photo held by the teacher: "Point to this picture." Then he is asked to "point to the one that matches," then to "Put the matching pictures together."

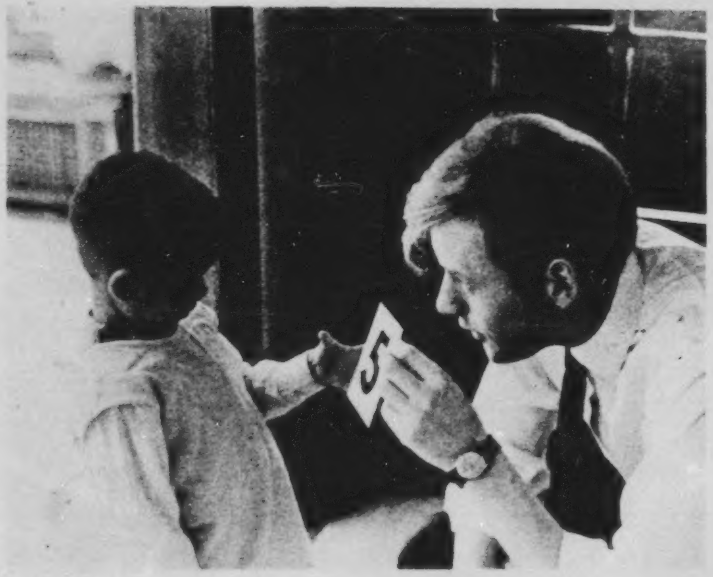


Fig. 9. Matching to present sample at Table Time. The teacher is giving the following controls: "This is a five. Can you say 'five'? Now take this into the dining room and find the five that matches." The child takes the number card with him and matches it to one of the cards already displayed in front of the seats. (See Fig. 17.)

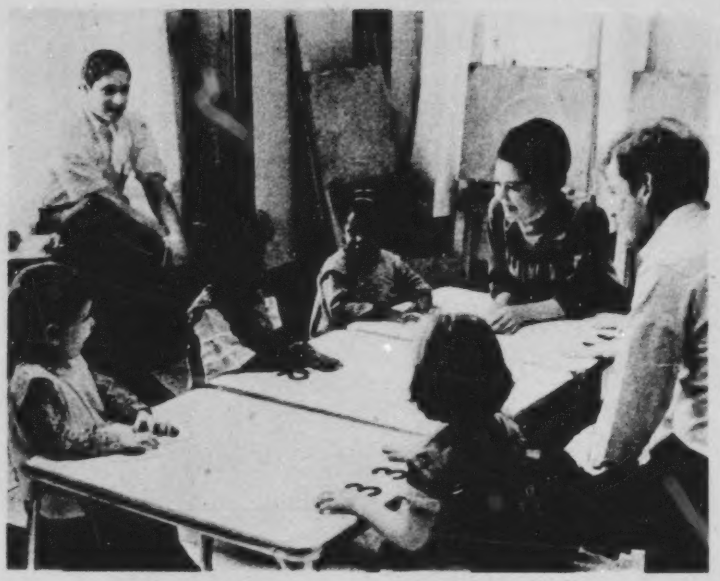
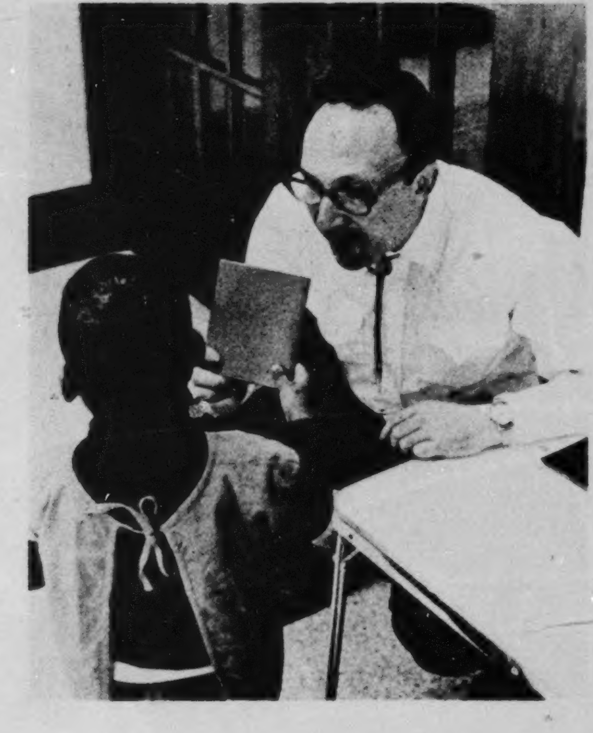


Fig. 10. Children are seated at matching numbers. The teacher is asking each child in turn, "Good morning, how are you?" Timer and scorer are sitting on the window seat in background.



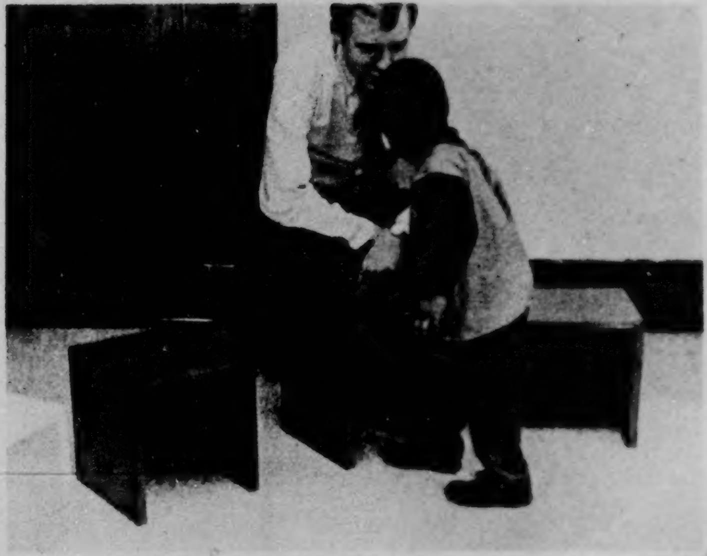


Fig. 11. Matching to present sample--colors. The child is given a color plaque and told to "Find the bench that matches." He takes the card across the room to the array of colored benches, and places his color (Fig. 12) on the matching bench.

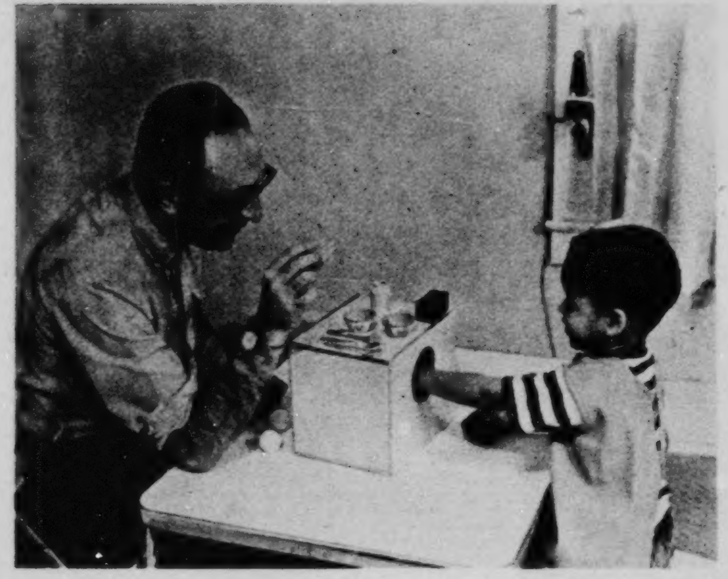


Fig. 13. Matching to present sample--objects. Another piece of equipment: the mystery matching box. E holds up an object with verbal control, "Can you reach in the box and find me one that matches?" The child must attend to tactile properties of objects, within a matching-to-sample paradigm.

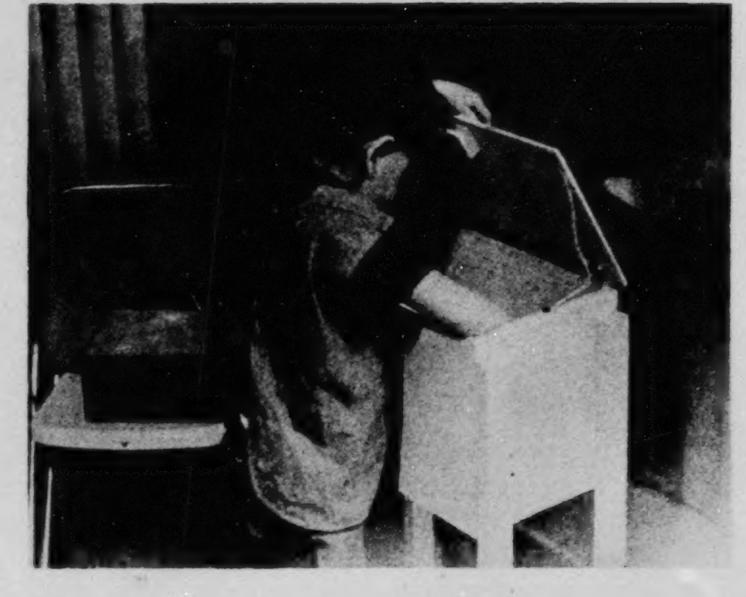


Fig. 14. Matching to absent sample, colors, using the Matching Box. In the RABbit Room the child is shown a color card and told to "Go over to the box" (across the room) and "bring me the color that matches."

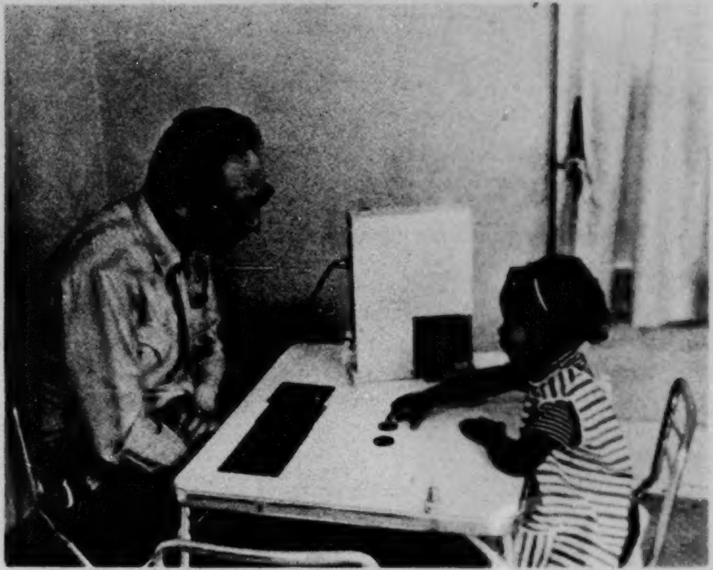


Fig. 15. Receptive color tacting, where child's pointing response is under the control of the teacher's vocal instructions: "Point to the red one," or "Point to the blue one," with a visual discrimination between two colors required for a criterion response.

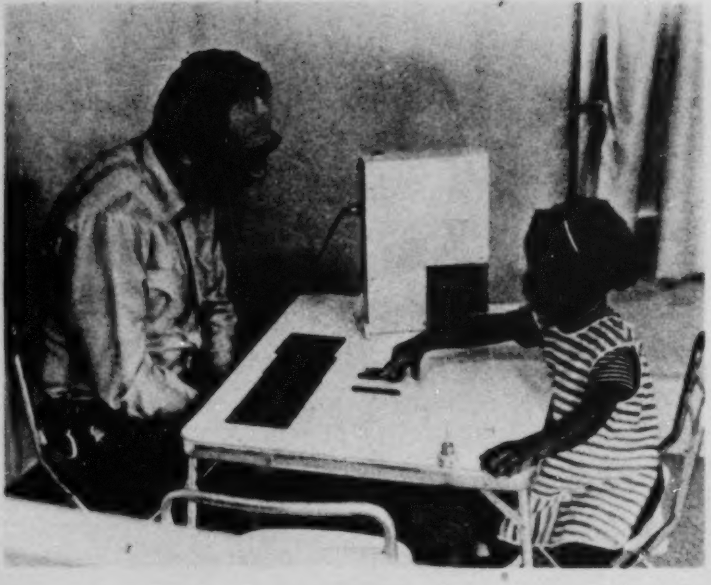


Fig. 16. The repertoire extended to more colors and to crayons. The response is still under control of what the teacher says.

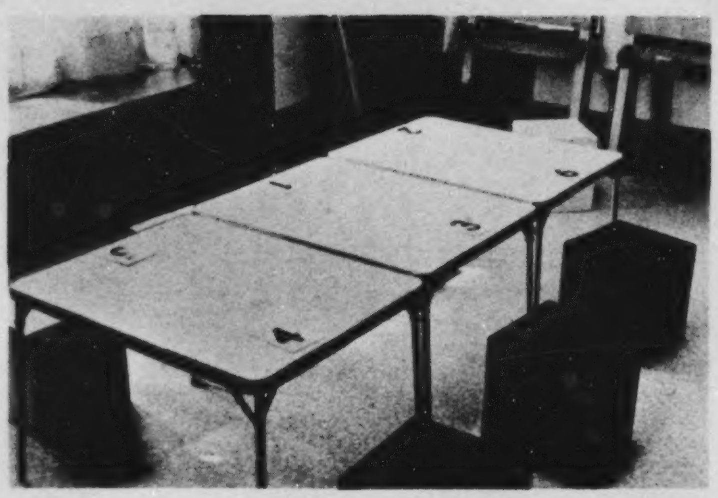


Fig. 17. One set-up for Table Time, a daily group activity in the dining room. Generalizing number-matching: children are sent into room and asked to take seats under control of "Sit down at the matching number" and visual S^D of matching number plaques.

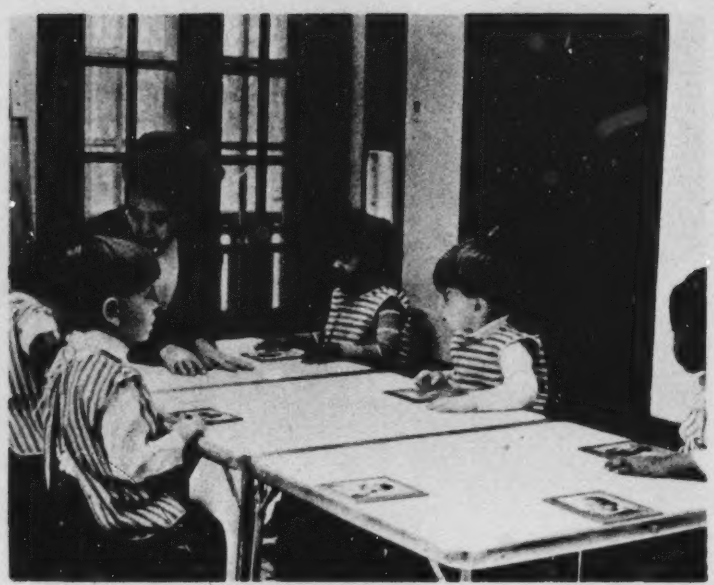


Fig. 18. Table Time II shows children sitting at places under control of their own photographs. They are being provided motor model and verbal instruction to "Put your hands flat on the table." The behavior of sitting down eventually came to control this response.

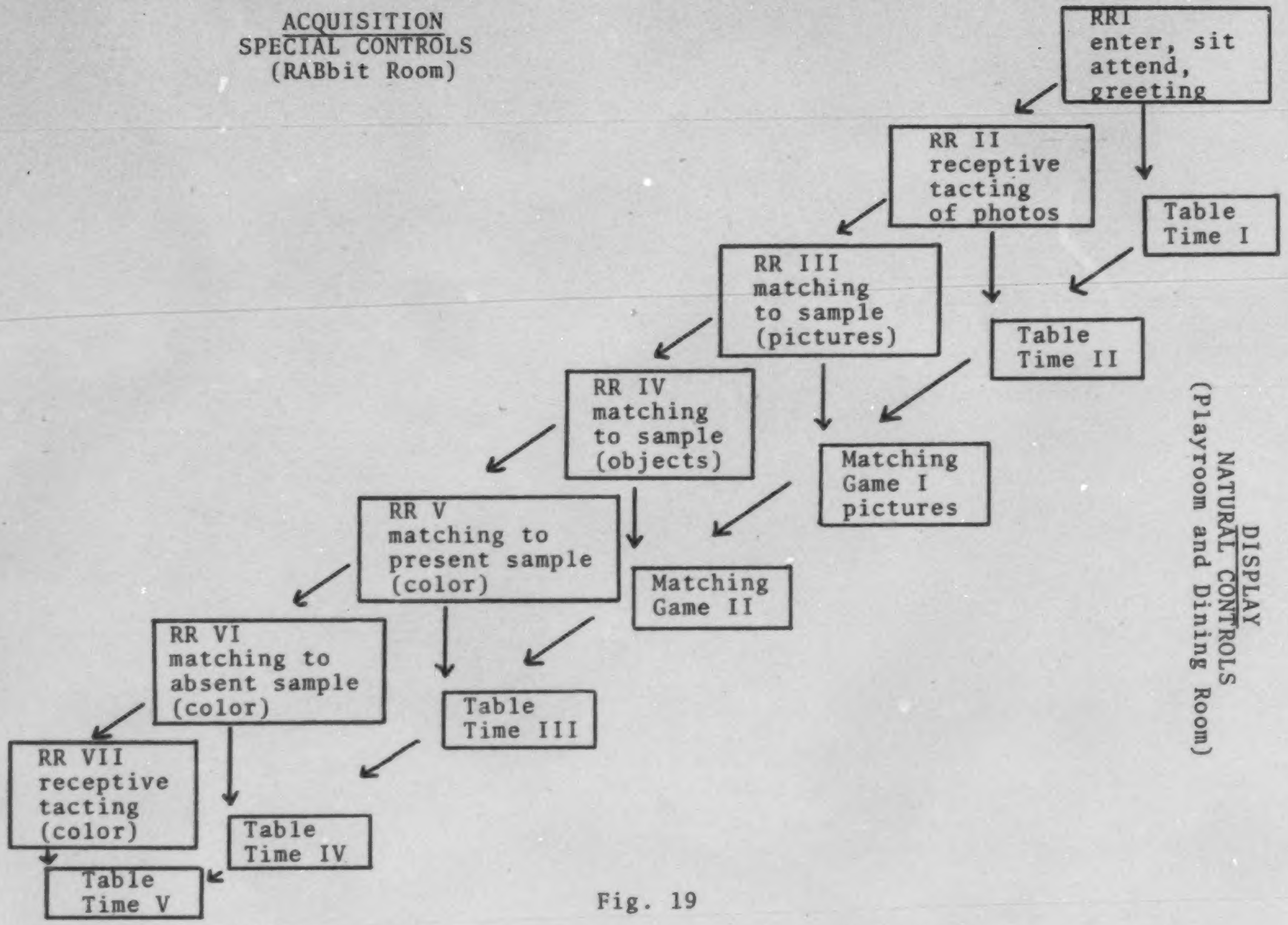

ACQUISITION
SPECIAL CONTROLS
(RABbit Room)
DISPLAY
NATURAL CONTROLS
(Playroom and Dining Room)
RRI enter, sit attend, greeting
RR II receptive tacting of photos
RR III matching to sample (pictures)
RR IV matching to sample (objects)
RR V matching to present sample (color)
RR VI matching to absent sample (color)
RR VII receptive tacting (color)
Table Time I
Table Time II
Matching Game I pictures
Matching Game II
Table Time III
Table Time IV
Table Time V

Fig. 19

Fig. 19. Convergence Strategy. The "bits" of behavior acquired in the RABbit Room were functionally maintained in a group setting with looser controls. From the first adaptation to the RABbit Room in the upper right hand corner, each child progressed through a series of programs, each serving as a requisite antecedent for the following one. As each criterion behavior (upper boxes) was acquired and displayed at high strength, it was integrated into a group or individual teaching session outside the RABbit Room, and made to function with natural controls and consequences. Where the child first displayed a behavior under tight controls administered by a teacher using a specific and undeviating script, and reinforced with tokens and audiovisual stimuli--he was brought to display the same behaviors outside the RABbit Room setting, where stimulus controls were subject to variation and consequences were predominantly social.

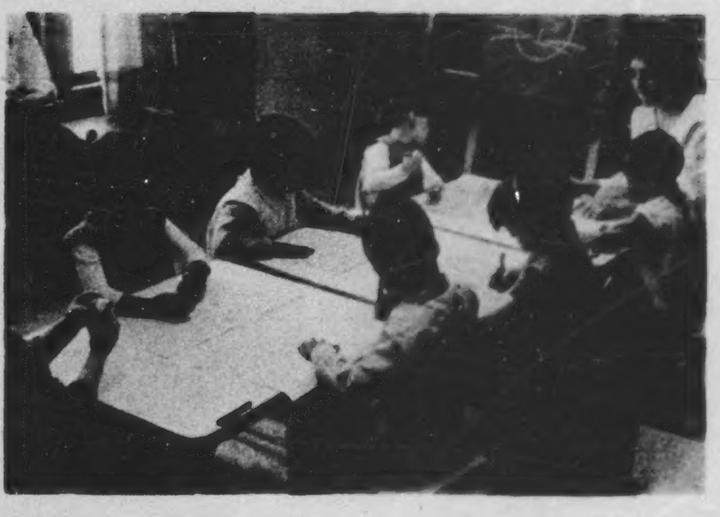


Fig. 20. Drawing. Model is provided on blackboard at right, with teacher supervising each drawing.

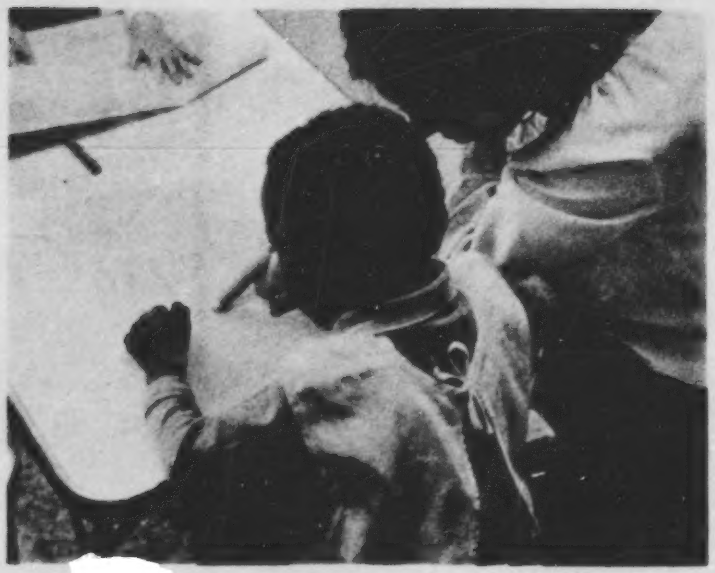


Fig. 21. Teacher gives control of "Draw a line 'til it touches my finger."

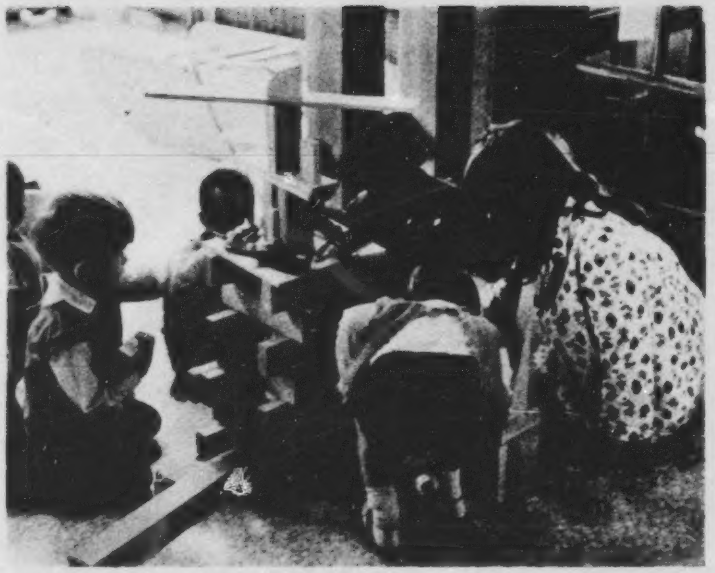


Fig. 22. Free play. A teacher builds a block house with children.

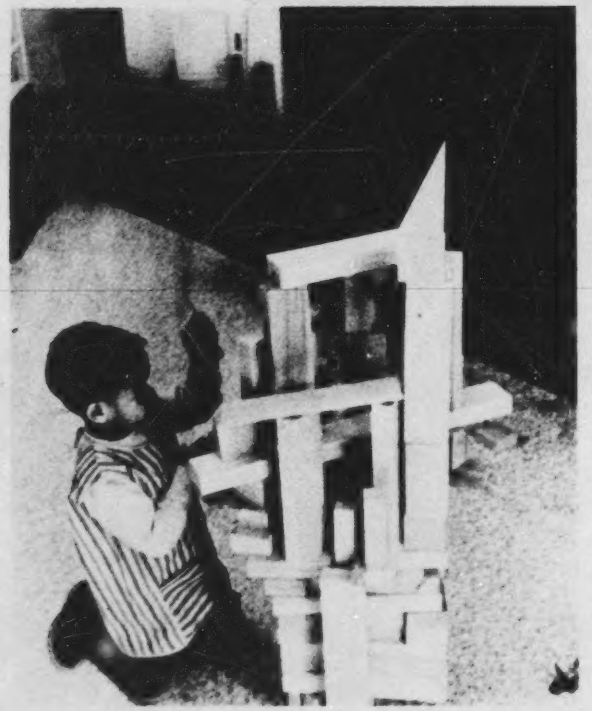


Fig. 23. Free play activity. Arnold building blocks.

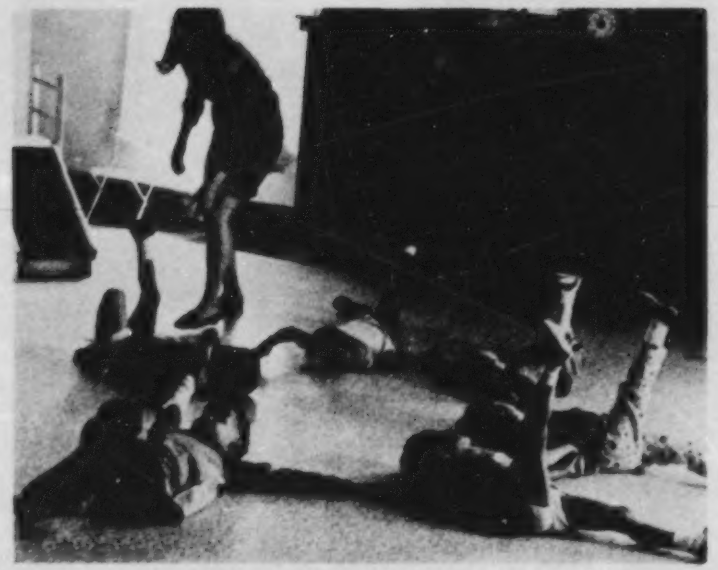


Fig. 24. Body tacting. Children are taught parts of the body under controls such as "Put your leg in the air," with verbal confirmation from the teacher.

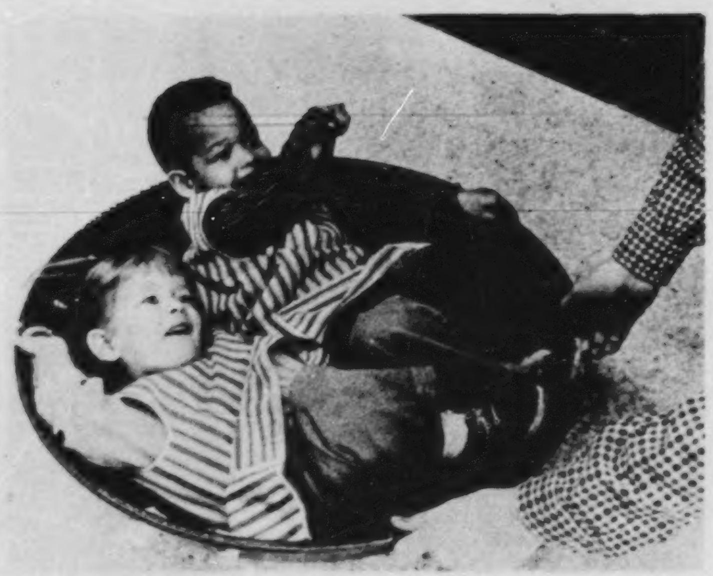


Fig. 25. The teacher has set up a contingency such as "Say 'Spin me!'" or "Tell me how many eyes I have" with spinning the children in the tub as a consequence.

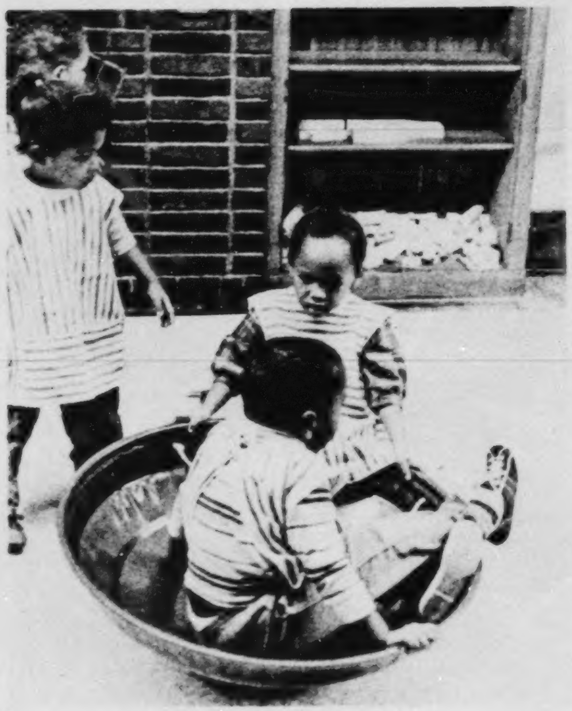


Fig. 26. Kiddie Contingency Management (KCM). Ronny is setting the contingency for Vincent of "Say 'Spin me.'" When he says it, she will spin him.

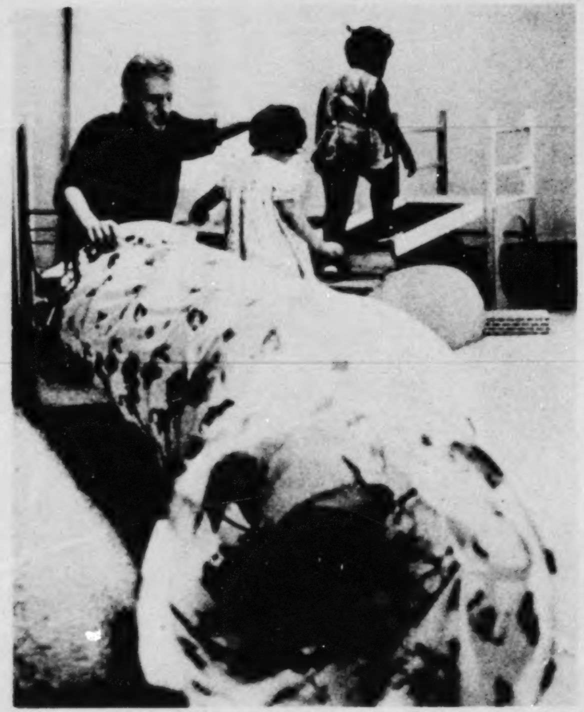


Fig. 27. The tunnel game. An example of a fairly complex chain of contingencies. The child may enter the tunnel after emitting a response determined by E_1. He can emerge from the tunnel by emitting another response for E_2 (shown), after which he may climb over the upside-down rocking boat and onto the slide, where sometimes a third E is placed to arrange an additional contingency.

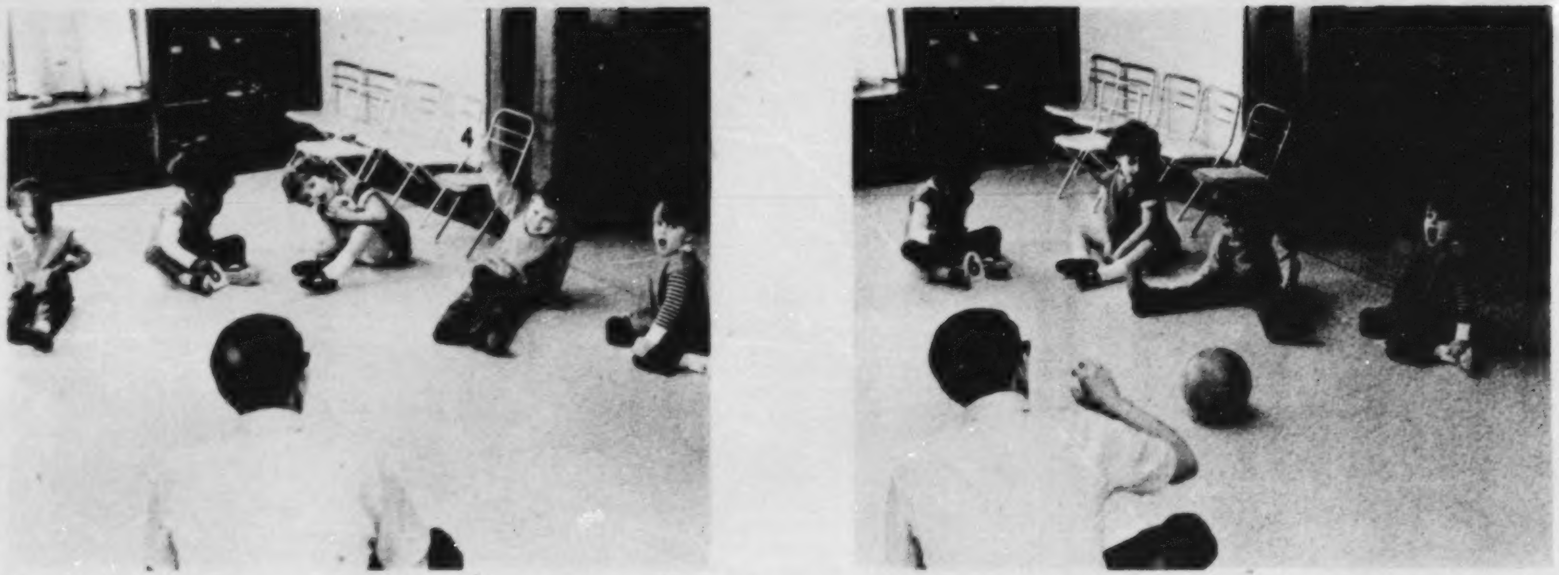


Fig. 28 and 29. Ball game. Each child is given a number card, and children make semi-circle around the teacher. His control is "Who's got the four?" Child with four says "Me," or holds up card, whereupon E rolls ball to him.

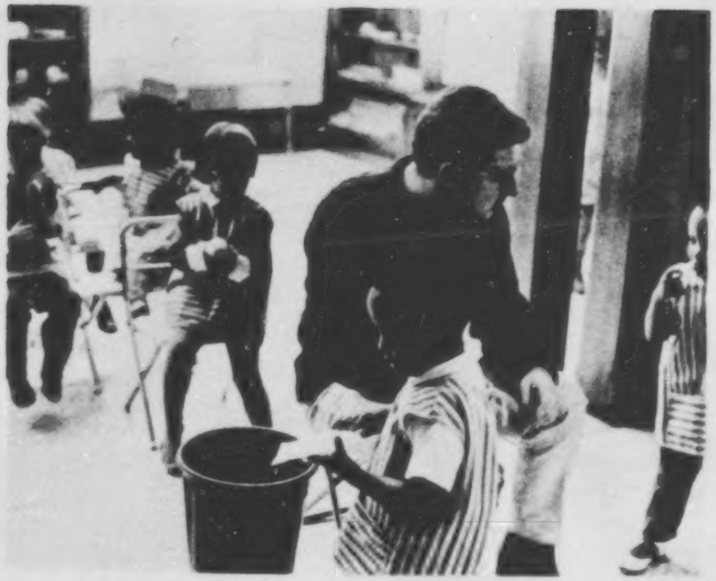


Fig. 30. Variation of "the bus game," designed here as a nursery school management tactic--getting the children washed before lunch, quickly and quietly, and into the dining room. The teacher who is "Conductor" gives out "tickets" to children getting on bus, each containing a Wash-and-Dri towelette. He tears the ticket and gives cloth to child, who takes seat and washes.

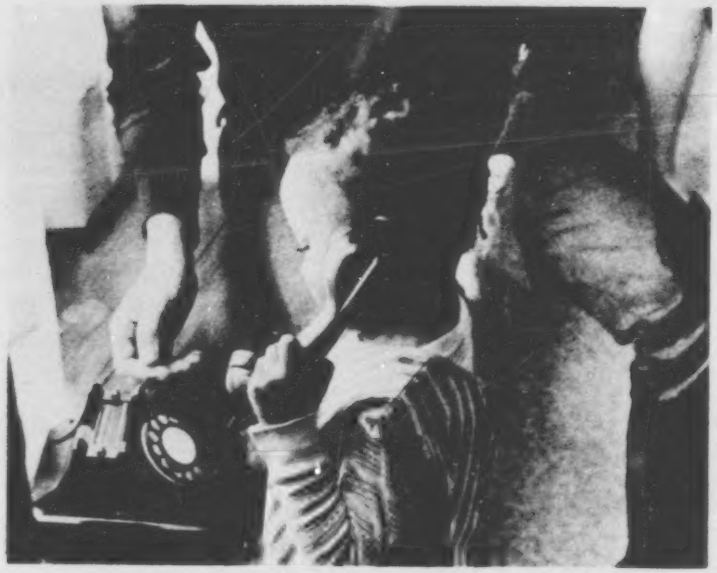
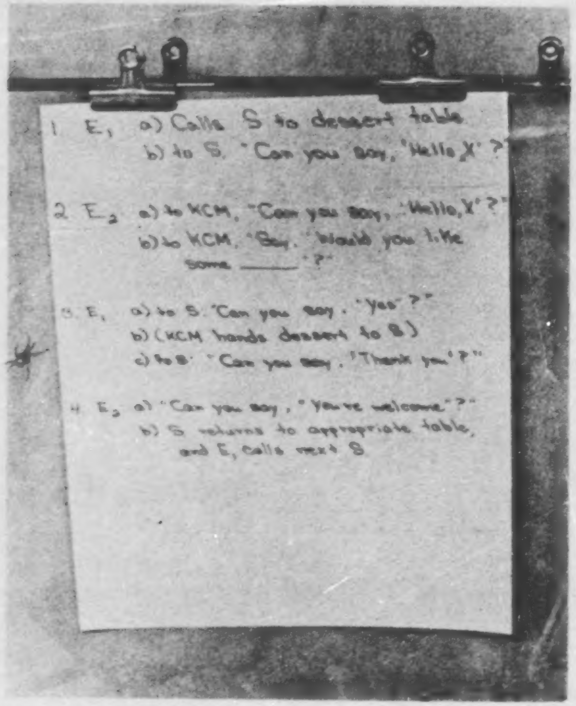


Fig. 31. Shaping the topography of talking on the telephone. Beginning activity of Telephone Time, where children take turns talking on a real telephone to a teacher in another room. Ronny is being shaped to hold the receiver at appropriate distance from mouth and ear.



1. E_1 a) Calls S to dessert table
b) to S. "Can you say, 'Hello X'?"

2. E_2 a) to KCM, "Can you say, 'Hello, X'?"
b) to KCM, "Say, 'Would you like
some ______'?"

3. E_1 a) to S. "Can you say, "Yes"?"
b) (KCM hands dessert to S)
c) to S: "Can you say, 'Thank you'?"

4. E_2 a) "Can you say, "You're welcome"?"
b) S returns to appropriate table,
and E_1 calls next S

Fig. 32. Cue board for Kiddie Contingency Management at dessert time with one child acting as teacher for other children.

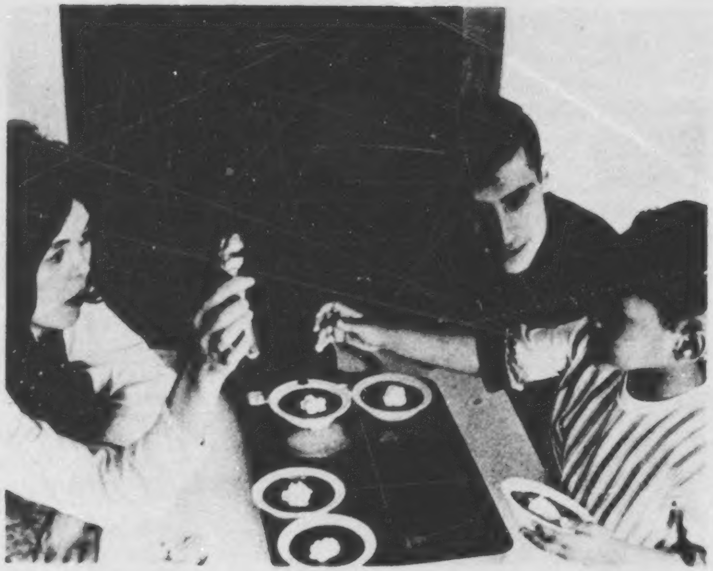


Fig. 33. Regular dessert contingency. Teacher says, "Say 'Please give me a spoon'." Child is given spoon as soon as he makes request.

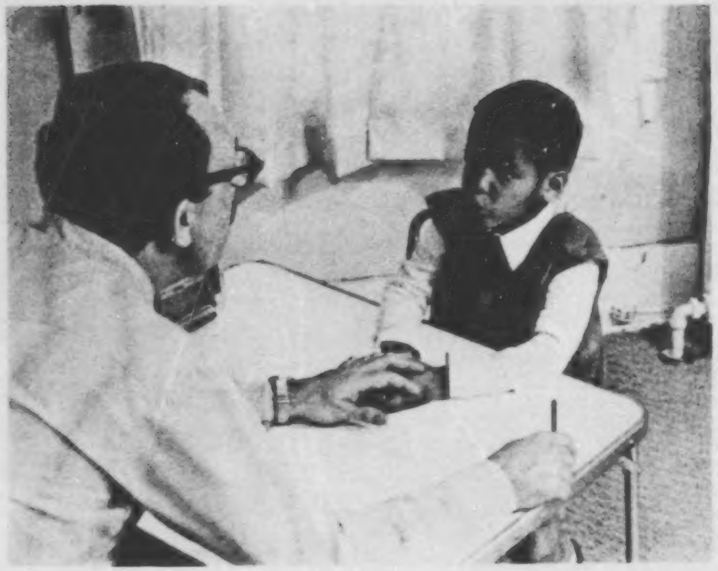


Fig. 34. Articulatory training. Model imitation. Child must attend to the vocal and visual properties of the teacher's model.

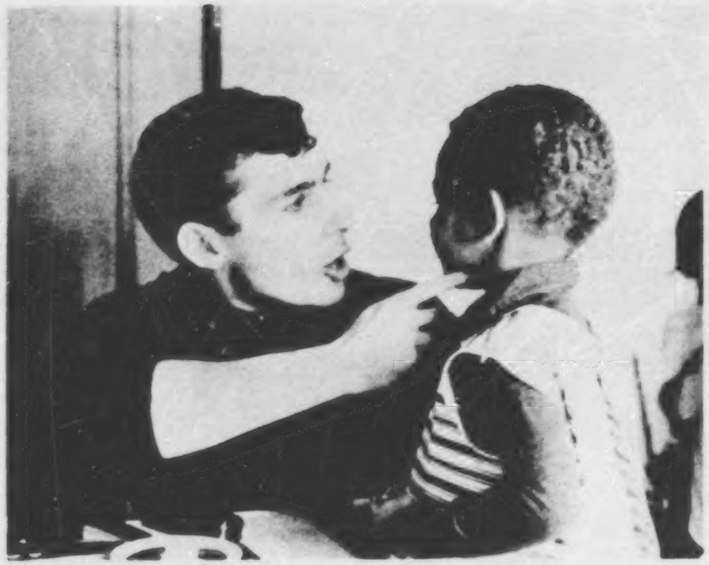


Fig. 35. Articulatory shaping during dessert contingency. When dessert is the consequence, a fairly refined criterion performance can be set for the child: a longer string of behavior can be shaped when the consequences are strongly reinforcing.

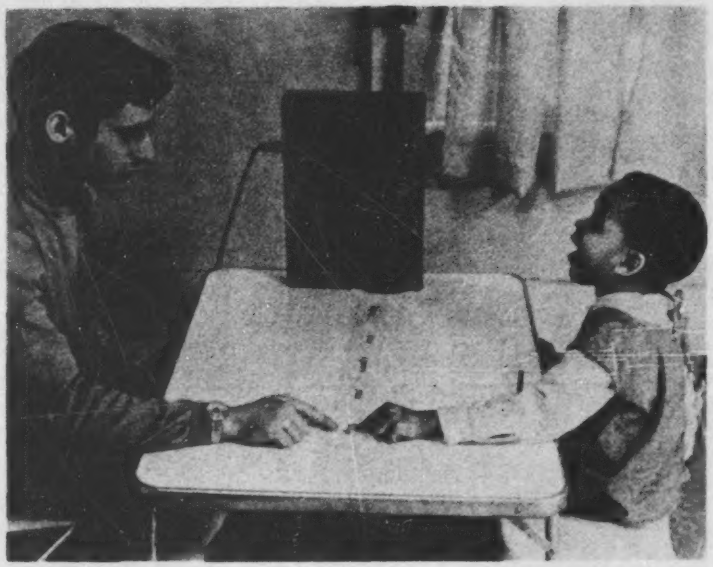


Fig. 36. Experimental Reading Program. Response is at first under the control of the E's vocal model, the printed card and small plastic figures representing the items named (dog and baby, etc.)--eventually under the control of the printed card (as shown).

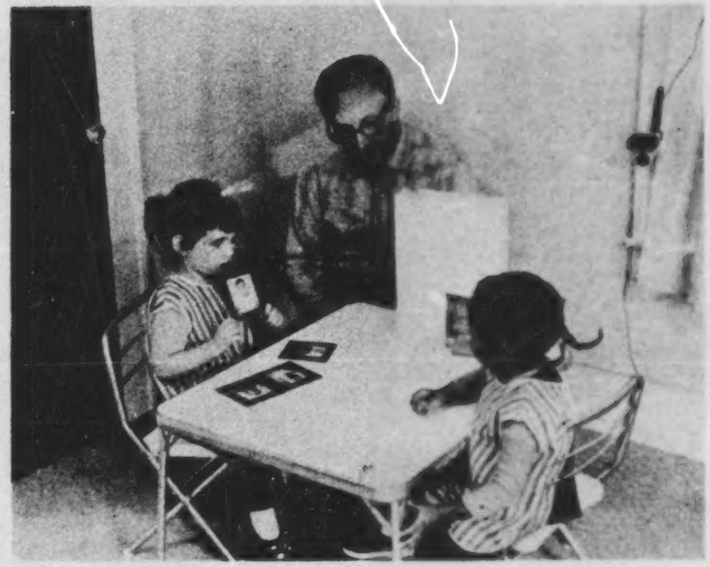


Fig. 37. Role reversal in RABbit Room. Kathy is sitting in the teacher's chair and presenting staff pictures to Lisa. The teacher administers tokens. Children take turns at the reinforcement devices setting up contingencies for each other.

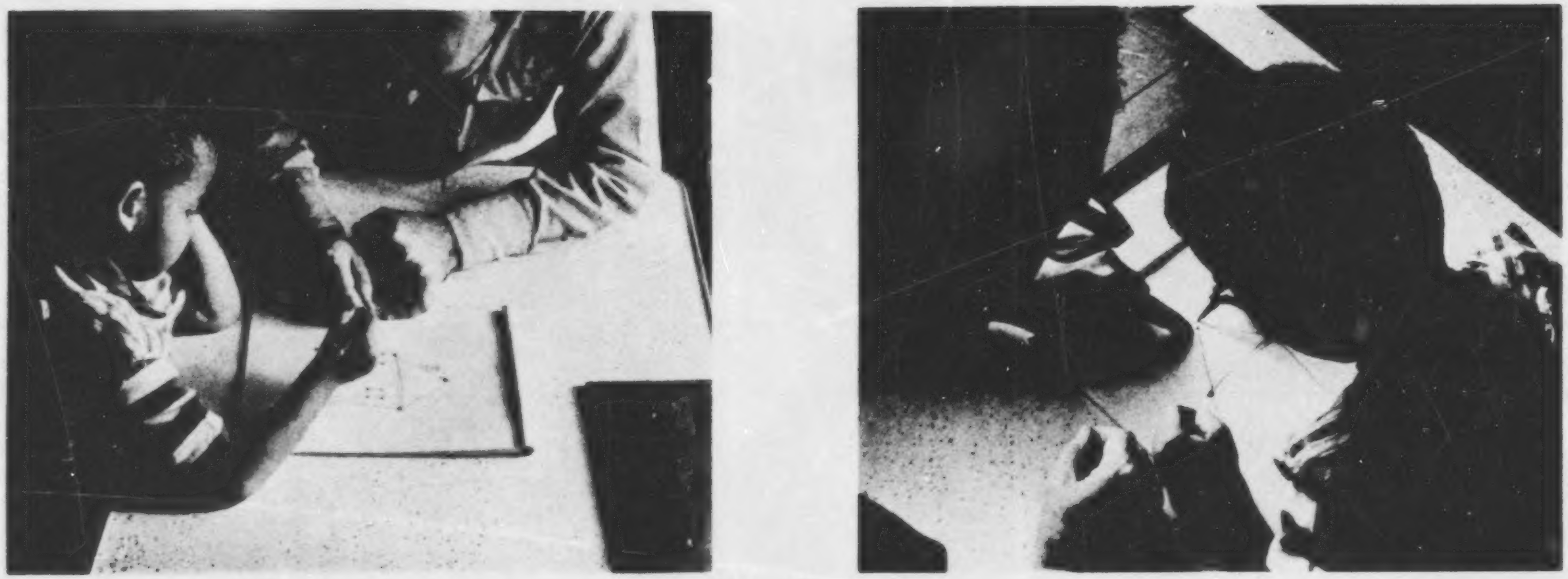


Fig. 38 and 39. Draw-a-House program. Child has first connected dots by tracing over drawing boards shown in upper right--where grooves in wood guide pencil from dot to dot. Here child is connecting dots on plain paper. Under control of the teacher's instruction "Draw a line 'til it touches my finger," he is making the roof of the house. The same procedure is used in the next figure for the windows and door of the house.

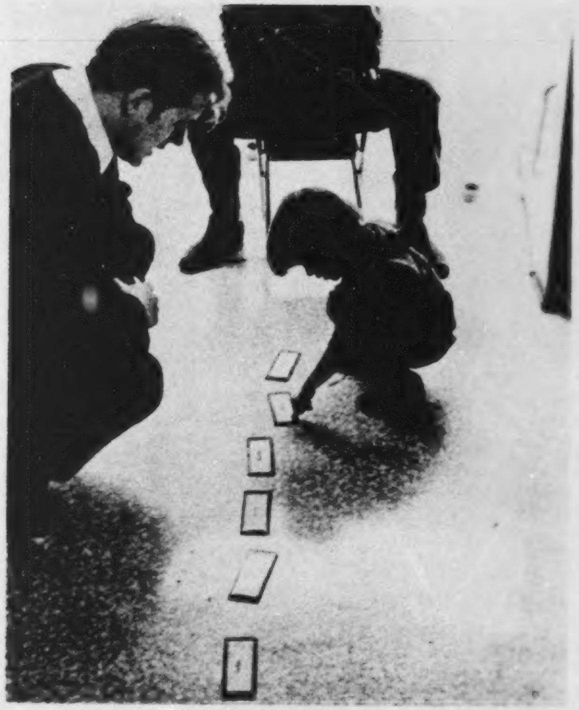
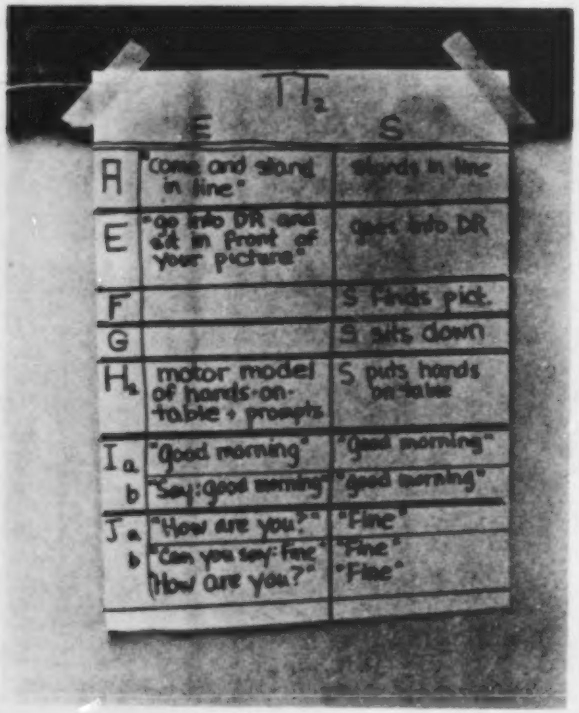


Fig. 40. Individual teaching session. Name reading, where receptive tacting is under the control of the printed letters.



TT_2

	E	S
A	"Come and stand in line"	stands in line
E	"go into DR and sit in front of your picture"	goes into DR
F		S finds pict.
G		S sits down
H_2	motor model of hands-on-table + prompts	S puts hands on table
I a	"Good morning"	"Good morning"
b	"Say: good morning"	"good morning"
J a	"How are you?"	"Fine"
b	"Can you say: Fine" "How are you?"	"Fine" "Fine"

Fig. 41. Cue board for Table Time, program II. Teacher's controls are in the left column, S's criterion responses in the right. Letters on the left are coded according to function of the control stimulus, and are provided for the scorer.

NOTES

1. The discussion of the rationale and theoretical framework of the research draws extensively from two recent papers of the writer: "Engineering Verbal Behavior," presented at the Conference on Problems in the Teaching of Young Children, Toronto, Canada, March, 1968, and "Designing Verbal Behaviors," presented at the Joseph P. Kennedy, Jr. Foundation International Scientific Symposium, Chicago,Illinois, April, 1968.

2. See the rationale for the Caldwell Preschool Inventory.

3. Sapon, S. M., op. cit. (above, note 1), "Engineering Verbal Behavior."

4. Skinner, B. F. Science and Human Behavior. New York: Macmillan, 1953, pp. 108-110.

5. Ibid., p. 59, passim.

6. Skinner, B. F., op. cit.

7. Sapon, S. M., "Receptive" and "Expressive" Language, a paper presented at the 1965 Meeting of the American Psychological Association, Division 7.

APPENDIX
(See p. 34)

SCORING SYSTEM:

The scoring procedure for quantifying and recording Ss' daily progress in RABbit room sessions was arranged according to classes of responses (i.e., controls: receptive tact, productive tact, productive mand, etc.). Score for each response was based roughly on the number of steps necessary before S produced a criterion response. Score for each response was recorded on the vertical axis and the number of S^Ds on the horizontal. At the end of each session, percentage of criterion responses out of total for each behavioral class was calculated and recorded on the sheet.

Responses are scored roughly on the following basis:

5 points	criterion response to E's S^D
4	E must supply further S^D before S produces criterion response
3	after further S^D, S answers incorrectly and E must supply further S^D
2	response garbled, E must provide model
1	response garbled or incorrect and E must supply several models before criterion response is produced
0	no response, S looks away, plays with tokens, etc.

Scoring for productive mand, for example, was as follows. When S has received a number of tokens (enough to fill up the token-storer), the E takes the tokens and the child over to the reinforcement devices. He takes up one token and asks

CONTROLS	CRITERION RESPONSE	SCORE
A. (1) "Where do you want to put it?"	"In the (twinkle box)"	5
B. (1)--→ "In there" (pointing)--→ (2) "Tell me"	"In the (twinkle box)"	4
C. (1 + 2)--→ "I don't know" --→ (3) model	"In the (twinkle box)"	3
D. (1 + 2 + 3) repeating these several times	"In the (twinkle box)"	2
E. (1 + 2 + 3)--→ "*¢&@#" (all garbled responses)		1

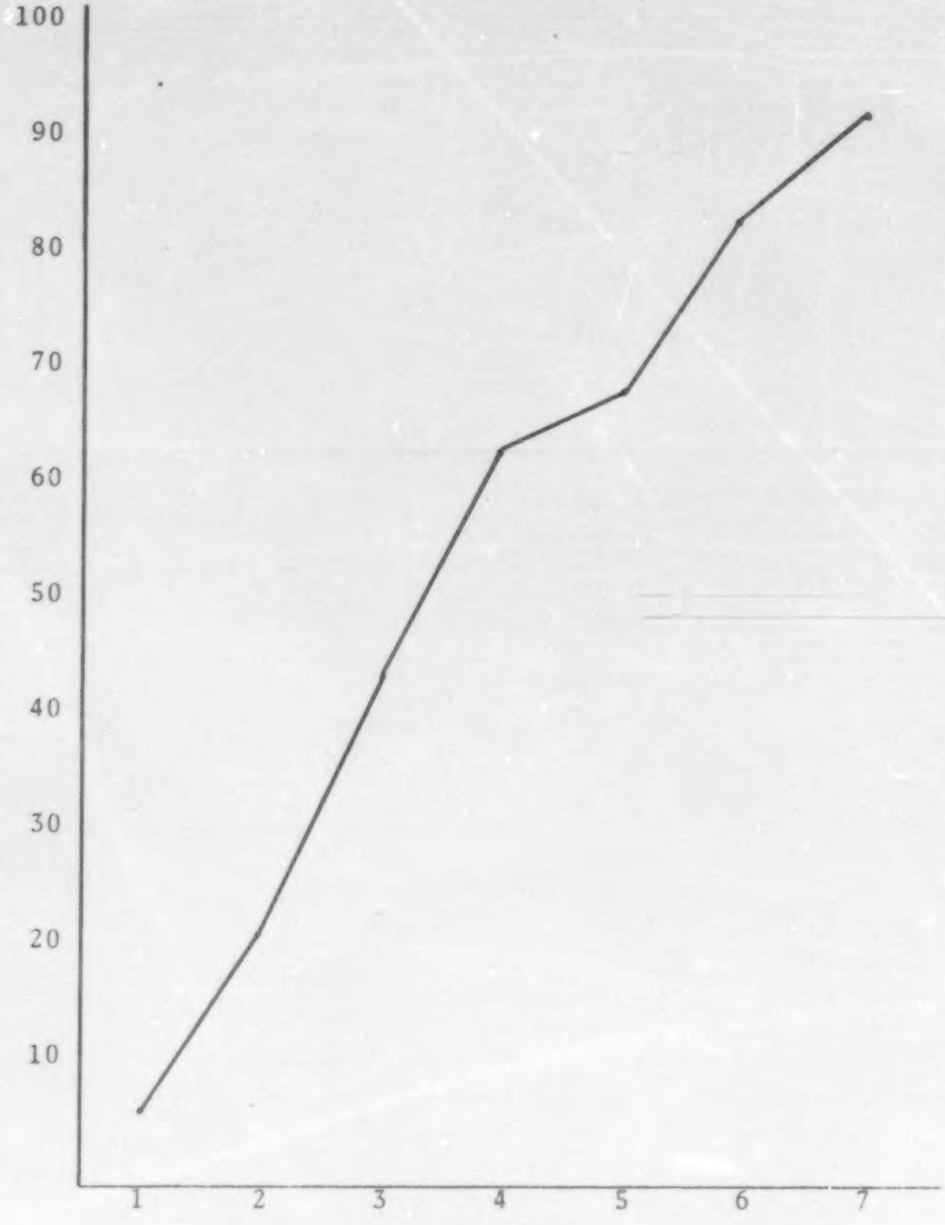
Score sheet for RABbit Room activity. Boxes A and B concern social behavior; Box C concerns productive tacting (when the child was asked to name pictures of staff); Box D, receptive tacting, (he was asked to point to pictures of staff); and Box E, productive mand (when the child is asked to name the reinforcement device in which he wants to spend his token). Box E, for example, is scored as follows:

			Score
(1) S^D:		"Where do you want to put it?"	
	R:	"In the (Twinkle Box)"	5
(1) ------R:		"In there" (pointing)	
(2)	E:	"Tell me"	
	R:	"In the (Twinkle Box)"	4
(1+2) ----R:		"I don't know"	
(3)	E:	(provides model)	
	R:	"In the (Twinkle Box)"	3
(1+2+3) --E		repeats these steps several times	
	R:	"In the (Twinkle Box)"	2
(1+2+3) --R:		garbled	1
	R:	no response, looks out window, etc.	0

As a sample, to indicate the ways in which the scoring system might be used to indicate the cumulative progress of children over a period of time, a graph is included showing three children's scores (% of criterion responses) for three weeks in productive manding (Section E).

Table I

Productive Manding for three children over seven sessions: mean percentage of criterion responses out of total responses.



Scoring sheets for Table Time. S^Ds provided by E are listed under the score chart. In the earlier sessions, several steps were incorporated into a few. A score of 5 indicates criterion performance; 4 that E must repeat directions; 3 that the child pointed to the wrong picture, etc.; 2 that a series of models were provided; 1 that the response was garbled or digitally obstructed; and 0 that the child did not move at all.

Tacting Staff Pictures

(1) "Who is this?" [Mike]---------- "Mike"	[5]
(1) --------------------- "I don't know" (2) This is Mike. Who is this? --------"Mike"	[4]
(1) ---------------[Mike] ------------ "Kevin." (2) ------------------------------------"Mike."	[3]
(1) -------------------------"+[#$%]&*(" (3) "Can you say 'Mike?'" ------------- "Mike" (1) or (1) and (2) ------------------- "Mike."	[2]
Same as above except for the fact that there are multiple models and responses before an acceptable "Mike" is emitted.	[1]
No response, or looks away, plays with tokens, chair, etc.	[0] no mark on sheet

Pointing...receptive pointing

DAILY DATA SHEET

S Kevin

Date 10/4/67

Session

A

"Good morning"	5				Total
"Fine"	5				Total
"Goodbye"	5				Total

B

Dessert Name	5	5		Total
Dessert Mand	0	0	5	Total
				Total

C

Productive Tacting

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Picture Tacting	1																					
BW	2																					
MC	3																					
TS	4																					
	5	✓	✓	✓	✓																	

Grand Total

Receptive

			1	2	3	4	5	6	7	8	9	10	Total
D	BW	1											
	MC	2											
	TS	3											
		4											
		5		✓	✓	✓	✓	✓					

Grand Total

% Criterion

A	100%
B	60%
C	100%
D	83%
E	73%

Productive - Mand

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
E	TB	1																					
	MB	2																					
	SB	3		✓							✓												
		4			✓																		
		5	✓			✓	✓	✓	✓	✓		✓	✓										

Grand Total

CLDC Activity: Table Time Date: 10/24 E_1: HDB E_2: BW

	Arnold	Kathy	Lisa	Liva	Kevin	Rene	Parnice
A	/ 5	/ 5	/ 5	/ 5	/ 5	/ 5	/
B	/ 5	/ 5	/ 5	/ 5	/ 5	/ 5	/
C	/ 5	/ 5	/ 5	/ 5	/ 5	/ 5	/
D	/ 5	/ 5	/ 5	/ 5	/ 5	/ 5	/
E	/ 5A	/ 4	/ 5	/ 5	/ 5	/ 5	/
F	/	/	/	/	/	/	/
G	/	/	/	/	/	/	/
H	/	/	/	/	/	/	/
I	/	/	/	/	/	/	/
K	/	/	/	/	/	/	/

BEHAVIORS (to be listed in terms of controls)

A = Go over to table.

B = Sit down at your picture.

C = Put your hands on table.

D = "Good morning"

E = "Fine"

F =

G =

H =

I =

K =

LIST OF RELATED PUBLICATIONS

by

Stanley M. Sapon

"Contingency Management in the Modification of Verbal Behavior in Disadvantaged Children," a paper read at the American Psychological Association meeting, Division 25, Washington, D.C., September, 1967, *International Review of Applied Linguistics*, in press.

"Problems in the Establishment of Verbal Behavior in Very Young Children," a paper read at the Institute for Behavioral Research, Silver Spring, Maryland, November, 1967.

"Engineering Verbal Behavior," a paper read at Conference in Problems in the Teaching of Young Children, The Ontario Department of Education and the Department of Applied Psychology, The Ontario Institute for Studies in Education, Toronto, Ontario, Canada, March, 1968. Proceedings of conference in press.

"Designing Verbal Behaviors," a paper read at the International Scientific Symposium, The Joseph P. Kennedy, Jr. Foundation, Chicago, Illinois, April, 1968. Proceedings of symposium in press.

"Contingency Management and Programed Instruction in the Pre-school," *Audiovisual Instruction*, Vol. 13, No. 9, November, 1968, pp. 980-982.

Interim Reports 1, 2, 3, 4, and 5 on this project are available as publications of the Verbal Behavior Laboratory.